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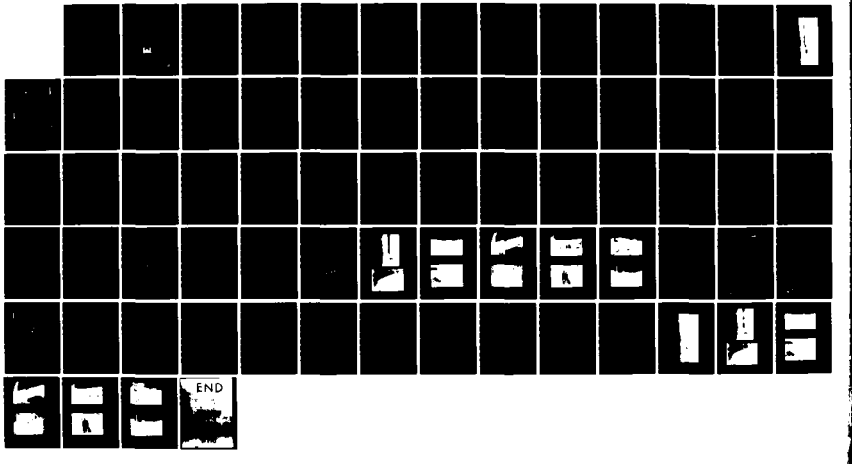

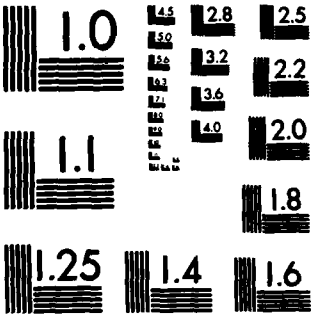

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THAMES RIVER BASIN
BOZRAH, CONNECTICUT

YANTIC RIVER DAM
CT 00654

PHASE I INSPECTION REPORT
NATIONAL DAM INSPECTION PROGRAM

DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
WALTHAM, MASS. 02154

MARCH, 1981

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER CT 00654	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Yantic River Dam NATIONAL PROGRAM FOR INSPECTION OF NON-FEDERAL DAMS		5. TYPE OF REPORT & PERIOD COVERED INSPECTION REPORT 6. PERFORMING ORG. REPORT NUMBER
7. AUTHOR(s) U.S. ARMY CORPS OF ENGINEERS NEW ENGLAND DIVISION		8. CONTRACT OR GRANT NUMBER(s)
9. PERFORMING ORGANIZATION NAME AND ADDRESS		10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS DEPT. OF THE ARMY, CORPS OF ENGINEERS NEW ENGLAND DIVISION, NEDED 424 TRAPELO ROAD, WALTHAM, MA. 02254		12. REPORT DATE March 1981 13. NUMBER OF PAGES 50
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)		15. SECURITY CLASS. (of this report) UNCLASSIFIED 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

APPROVAL FOR PUBLIC RELEASE: DISTRIBUTION UNLIMITED

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

Cover program reads: Phase I Inspection Report, National Dam Inspection Program; however, the official title of the program is: National Program for Inspection of Non-Federal Dams; use cover date for date of report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

DAMS, INSPECTION, DAM SAFETY,

Thames River Basin
Bozrah, Connecticut

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Yantic River Dam is an earth embankment with a gravity overflow section. They have combined length of approximately 323 feet and a maximum height of 18.2 feet. The dam is judged to be in fair condition with several areas that require attention. The dam is classified as SMALL and has a SIGNIFICANT hazard potential. The test flood, according to the guidelines, ranges from the 100 year flood th ½ the PMF.

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DEPARTMENT OF THE ARMY
NEW ENGLAND DIVISION, CORPS OF ENGINEERS
424 TRAPELO ROAD
WALTHAM, MASSACHUSETTS 02254

REPLY TO
ATTENTION OF:
NEDED

APR 2 1981

Honorable William A. O'Neill
Governor of the State of Connecticut
State Capitol
Hartford, Connecticut 06115

Dear Governor O'Neill:

Inclosed is a copy of the Yantic River Dam (CT-00654) Phase I Inspection Report, which was prepared under the National Program for Inspection of Non-Federal Dams. This report is presented for your use and is based upon a visual inspection, a review of the past performance and a brief hydrological study of the dam. A brief assessment is included at the beginning of the report. I have approved the report and support the findings and recommendations described in Section 7 and ask that you keep me informed of the actions taken to implement them. This follow-up action is a vitally important part of this program.

A copy of this report has been forwarded to the Department of Environmental Protection, the cooperating agency for the State of Connecticut. In addition, a copy of the report has also been furnished the owner, Gilman Brothers Company, Gilman, Connecticut 06336.

Copies of this report will be made available to the public, upon request, by this office under the Freedom of Information Act. In the case of this report the release date will be thirty days from the date of this letter.

I wish to take this opportunity to thank you and the Department of Environmental Protection for your cooperation in carrying out this program.

Sincerely,

C.E. EDGAR, III
Colonel, Corps of Engineers
Division Engineer

Incl
As stated

YANTIC RIVER DAM

CT 00654

THAMES RIVER BASIN

BOZRAH, CONNECTICUT

PHASE I INSPECTION REPORT

NATIONAL DAM INSPECTION PROGRAM

NATIONAL DAM INSPECTION PROGRAM

PHASE I INSPECTION REPORT

Identification Number:	CT 00654
Name:	Yantic River Dam
Town:	Bozrah
County and State:	New London County, Connecticut
Stream:	Yantic River
Date of Inspection:	November 5, 1980

BRIEF ASSESSMENT

The Yantic River Dam is an earth embankment with a gravity overflow section. They have a combined length of approximately 323 feet and a maximum height of 18.2 feet. A spillway is located on the northern side of the dam and is approximately 128 feet long. The concrete and masonry spillway is 4 feet lower than the top of the dam. A gate structure and sluiceway near the northern end of the dam supplies water to a downstream factory. There is a 24 inch low-level discharge pipe that passes through the base of the dam at the southern end of the spillway. The pipe is controlled by a gate on the upstream side of the dam and this gate is operable. The drainage area is 39.4 square miles and the reservoir has approximately 77 acre-feet of storage capacity.

The assessment of the dam is based on available information, visual inspection and hydraulic/hydrologic computations. The dam is judged to be in FAIR condition with several areas that require attention. These areas include: seepage through the earth embankment and the northern spillway training wall, settlement behind the spillway training wall, cracking and spalling of the sluiceway gate structure and brush and trees on the embankments and along the toe of the dam.

The dam is classified as SMALL and has a SIGNIFICANT hazard potential in accordance with guidelines established by the Corps of Engineers. The test flood, according to the guidelines, ranges from the 100 year flood to 1/2 the Probable Maximum Flood (PMF). The test flood for this dam is the 100 year flood and is calculated to be 6,175 cfs. The spillway capacity at the top of dam is 2,700 cfs or 44 percent of the test flood outflow. The test flood outflow will overtop the dam by approximately 2 feet. Approximately 550 feet downstream the failure floodwave would hit a factory built adjacent to the river.

It is recommended that the owner engage the services of a qualified registered engineer experienced in the design of dams to investigate the seepage through the earth embankment and the spillway training wall, settlement of the earth behind the spillway training wall and prepare a detailed hydraulic/hydrologic investigation to access further the potential of overtopping as well as the need for and the means to increase project discharge capacity. It is also recommended that the owner remove brush and trees from the embankment toe and downstream channel, repair the concrete at the sluiceway gate structure, establish a formal warning system and initiate an annual technical inspection program.

The owner should implement the recommendations and remedial measures described above and in greater detail in Section 7 within one year after receipt of this Phase I Inspection Report.

Joseph F. Merluzzo
Connecticut P.E. #7639
Project Manager

Gary J. Giroux
Connecticut P.E. #11477
Project Engineer

This Phase I Inspection Report on Yantic River Dam (CT-00654) has been reviewed by the undersigned Review Board members. In our opinion, the reported findings, conclusions, and recommendations are consistent with the Recommended Guidelines for Safety Inspection of Dams, and with good engineering judgement and practice, and is hereby submitted for approval.

ARAMAST MAHTESIAN, MEMBER
Geotechnical Engineering Branch
Engineering Division

CARNEY M. TERZIAN, MEMBER
Design Branch
Engineering Division

JOSEPH W. FINEGAN, JR., CHAIRMAN
Water Control Branch
Engineering Division

APPROVAL RECOMMENDED:

JOE B. FRYAR
Chief, Engineering Division

PREFACE

This report is prepared according to the Recommended Guidelines for Safety Inspection of Dams, for Phase I Inspections. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Inspection is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigations and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Inspection; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through continued care and inspection can there be any chance that unsafe conditions be detected.

Phase I Inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established guidelines, the Spillway Test Flood is based on the estimated Probable Maximum Flood for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and variety of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies considering the size of the dam, its general condition and the downstream damage potential.

The Phase I Inspection does not include an assessment of the need for fences, gates, "no trespassing" signs, repairs to existing fences and railings and other items which may be needed to minimize trespass and provide greater security for the facility and safety to the public. An evaluation of the project for compliance with Occupational Safety and Health Administration's (OSHA) rules and regulations is also excluded.

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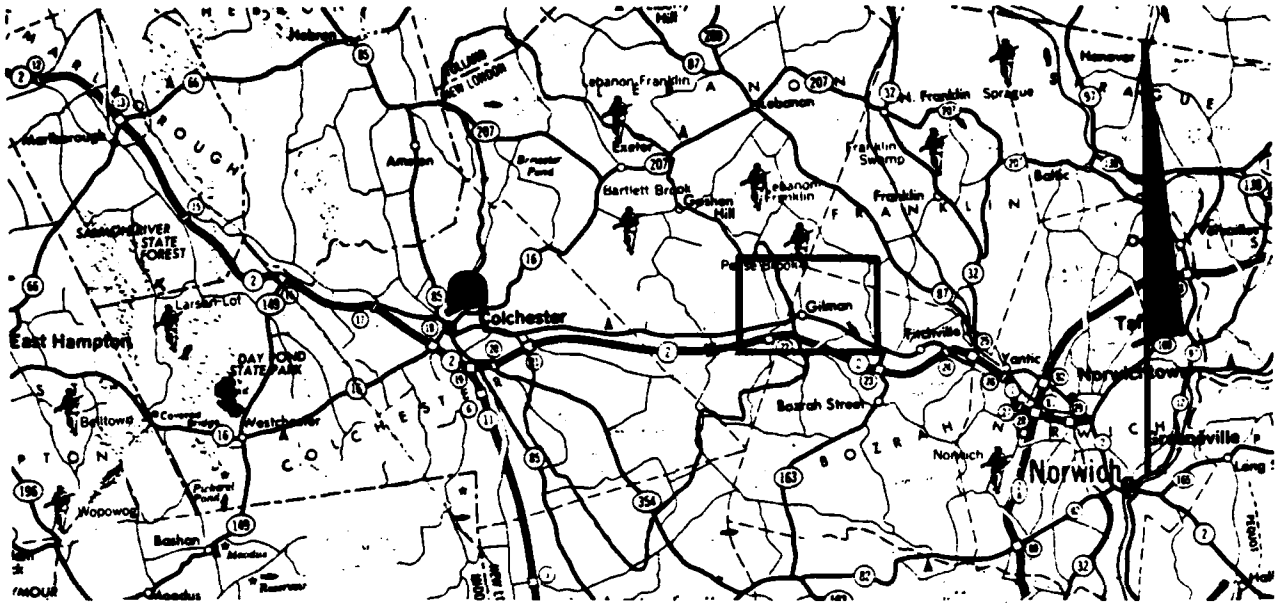
YANTIC RIVER DAM



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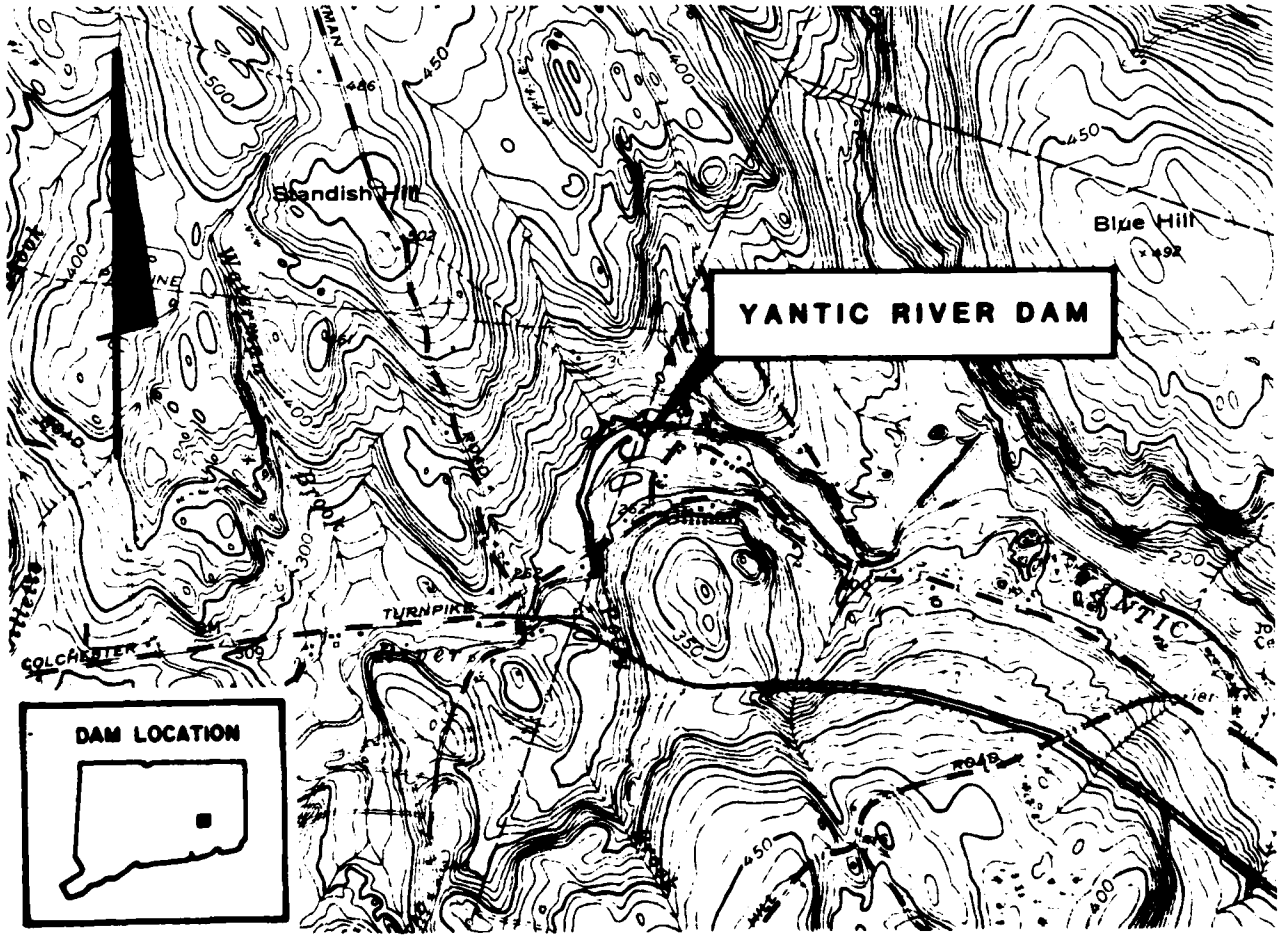

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US ARMY,CORPS OF ENGINEERS
NEW ENGLAND DIVISION
WALTHAM,MASS.

LOCATION MAP

PHASE I INSPECTION REPORT

YANTIC RIVER DAM CT 00654

SECTION 1 - PROJECT INFORMATION

1.1 General

a. Authority - Public Law 92-367, August 8, 1972 authorized the Secretary of the Army, through the Corps of Engineers, to initiate a National Program of Dam Inspection throughout the United States. The New England Division of the Corps of Engineers has been assigned the responsibility of supervising the inspection of dams within the New England Region. Storch Engineers has been retained by the New England Division to inspect and report on selected dams in the State of Connecticut. Authorization and notice to proceed were issued to Storch Engineers under a letter of October 30, 1980 from William E. Hodgson, Jr., Colonel, Corps of Engineers. Contract No. DACW33-80-C-0035 has been assigned by the Corps of Engineers for this work.

b. Purpose of Inspection -

(1) Perform technical inspection and evaluation of non-Federal dams to identify conditions which threaten the public safety and thus permit correction in a timely manner by non-Federal interests.

(2) Encourage and prepare the states to initiate quickly effective dam safety programs for non-Federal dams.

(3) To update, verify and complete the National Inventory of Dams.

1.2 Description of Project

a. Location - The Yantic River Dam and Gilman Pond is located in the Town of Bozrah, New London County, Connecticut. The dam and pond are approximately

850 feet north of the Norwich-Colchester Turnpike which runs parallel to the Yantic River. The coordinates of the dam are approximately 41°-34.8' north latitude and 72°-12.0' west longitude. The dam is located on the Yantic River and is approximately 3 miles upstream from its confluence with the Thames River.

b. Description of Dam and Appurtenances - The Yantic River Dam is an earth embankment with a gravity overflow section. They have a combined length of approximately 323 feet and a maximum height of 18.2 feet. Approximately 195 feet of the overall length is earth embankment with the remainder being spillway. The top of the embankment is 10 feet wide and the side slopes are approximately 1:1. The maximum height of the earth embankment is 10 feet.

The spillway is located near the northern end of the dam and is 128 feet long. The horizontal alignment of the spillway is V-shaped with the crest at the center of the spillway, angling back toward the pond at about 40° (See Photos 1 and 2). There are concrete abutments at either end that rise approximately 4 feet above the spillway crest to the top of the dam. Half of the downstream face below the spillway is concrete supported on ledge. The concrete face is on a 1:3 slope. The remainder of the downstream face is vertical stone masonry.

There is an inlet structure and sluiceway near the northern end of the dam that is used by a downstream factory for industrial purposes. The gate to the sluiceway is normally open though the capacity of the sluiceway is minimal compared to that of the total project. At the southern end of the spillway there is another gate structure which controls a 24 inch low-level discharge pipe that passes through the base of the dam. This gate is operable.

c. Size Classification - The Yantic River Dam has a maximum height of 18.2 feet and a capacity of approximately 77 acre-feet when the water level is

at the top of the dam. In accordance with the Recommended Guidelines for Safety Inspection of Dams established by the Corps of Engineers, the dam is classified as SMALL (height less than 40 feet, storage less than 1,000 acre-feet).

d. Hazard Classification - The Yantic River Dam is classified as having a SIGNIFICANT hazard potential. Failure of the dam could result in the possible loss of a few lives and cause appreciable property damage (See Photo 10 - Appendix C). Approximately 550 feet downstream, the flood wave would hit a factory building which houses a power plant and maintenance shops. The first floor sill of the factory is approximately 9 feet above the streambed. Estimated flow and water depth at this location just before dam failure is 2,700 cfs and 6 feet and just after dam failure is 8,230 cfs and 11 feet. The water would rise approximately 2 feet above the first floor sill of the factory. Also, in this area water would be flowing 1.5 to 2 feet deep in the street. Approximately 750 feet downstream, the floodwave would hit an abandoned building. Estimated water depths at this location will be 10 feet, just below the first floor sill.

e. Ownership - The Yantic River Dam is owned by:

Gilman Brothers Company
Gilman, Connecticut 06336
(203) 889-8444

f. Operator - Operating personnel are under the direction of:

Mr. Lawrence Gilman
Gilman Brothers Company
Gilman, Connecticut 06336
(203) 889-8444

g. Purpose of Dam - The dam was constructed to impound the Yantic River and form Gilman Pond. The pond supplies water for industrial use by the Gilman Brothers Company.

h. Design and Construction History - The Yantic River Dam was constructed around 1915. No documentation is available on the design or construction of the dam.

i. Normal Operational Procedures - The water level in Gilman Pond can be controlled by a low-level discharge pipe and, to a lesser degree, a sluiceway. Normally the sluiceway gate is open so water can be used by the factory.

1.3 Pertinent Data

a. Drainage Area - The drainage basin contributing to the dam is located in the Towns of Lebanon, Colchester, Bozrah and Columbia, Connecticut and is irregular in shape. The area of the drainage basin is 39.4 square miles (Appendix D - Plate 4). Approximately 5 percent of the drainage basin is natural storage and only about 5 percent of the area has been developed. The topography is rolling with elevations ranging from 660 (NGVD) to 230.0 (NGVD) at the spillway crest.

b. Discharge at Damsite - There are no records available for discharge at the dam.

(1)	Outlet works (conduit) size:	24 inches
	Invert elevation (feet above NGVD):	215.8
	Discharge Capacity at top of dam:	85 cfs
(2)	Maximum known flood at damsite:	Unknown
(3)	Ungated spillway capacity at top of dam:	2,700 cfs
	Elevation (NGVD):	234.0
(4)	Ungated spillway capacity at test flood elevation:	5,250 cfs
	Elevation (NGVD):	236

(5)	Gated spillway capacity at normal pool elevation:	N/A
	Elevation (NGVD):	N/A
(6)	Gated spillway capacity at test flood elevation:	N/A
	Elevation (NGVD):	N/A
(7)	Total Spillway capacity at test flood elevation:	5,250 cfs
	Elevation (NGVD):	236
(8)	Total project discharge at top of dam:	2,785 cfs
	Elevation (NGVD):	234.0
(9)	Total project discharge at test flood elevation:	6,175 cfs
	Elevation (NGVD):	236

c. Elevation (feet above NGVD)

(1)	Streambed at toe of dam:	215.8
(2)	Bottom of cutoff:	Unknown
(3)	Maximum tailwater:	223.8
(4)	Normal pool:	230.0
(5)	Full flood control pool:	N/A
(6)	Spillway crest (ungated):	230.0
(7)	Design surcharge (original design):	Unknown
(8)	Top of dam:	234.0
(9)	Test flood surcharge:	236

d. Reservoir (length in feet)

(1)	Normal pool:	1,590

	(2) Flood control pool:	N/A
	(3) Spillway crest pool:	1,590
	(4) Top of dam:	2,090
	(5) Test flood pool:	2,290
e.	Storage (acre-feet)	
	(1) Normal pool:	39
	(2) Flood control pool:	N/A
	(3) Spillway crest pool:	39
	(4) Top of dam:	77
	(5) Test flood pool:	119
f.	Reservoir Surface (acres)	
	(1) Normal pool:	4
	(2) Flood control pool:	N/A
	(3) Spillway crest:	4
	(4) Test flood pool:	20
	(5) Top of dam:	16
g.	Dam	
	(1) Type:	Concrete/masonry and earth embankment
	(2) Length:	323 feet
	(3) Height:	18.2 feet
	(4) Top width:	10 feet
	(5) Side slopes:	1:3 at concrete portion/ 1:1 at earth embankment

	(6) Zoning:	Unknown	
	(7) Impervious Core:	Unknown	
	(8) Cutoff:	Unknown	
	(9) Grout curtain:	Unknown	
	(10) Other:	N/A	
h.	Diversion and Regulating Tunnel	N/A	
i.	Spillway		
	(1) Type:	Concrete broad crested weir	
	(2) Length of weir:	128 feet	
	(3) Crest elevation	230.0	
	(4) Gates:	None	
	(5) U/S channel:	None	
	(6) D/S channel:	Natural channel with ledge	
	(7) General:	N/A	
j.	Regulating Outlets	Pipe	Sluiceway
	(1) Invert elevation (NGVD):	215.8	228.0
	(2) Size:	24 inches	7' wide x 3' high
	(3) Description:	Metal pipe	Stone channel
	(4) Control Mechanism	Manually operated gates	
	(5) Other:	Gates are operable	

SECTION 2 - ENGINEERING DATA

2.1 Design Data

No design computations or drawings are available for this dam.

2.2 Construction Data

The dam was constructed around 1915. No construction drawings or data are available for this dam.

2.3 Operation Data

The pond water is supplied to a downstream factory through a gate structure and sluiceway. A low-level discharge pipe and gate are also operable.

2.4 Evaluation of Data

a. Availability - No design, construction or operation documents are available for this dam.

b. Adequacy - Since no information was available a visual inspection and hydraulic/hydrologic computations were used to assess the condition of the facility.

c. Validity - The conclusions and recommendations found in this report are based on a visual inspection, contacts with the owner and hydraulic/hydrologic computations.

SECTION 3 - VISUAL INSPECTION

3.1 Findings

a. General - A visual inspection was conducted on November 5, 1980 by members of the engineering staff of Storch Engineers, D. Baugh and Associates, Inc. and Matthews Associates. A copy of the visual inspection checklist is contained in Appendix A of this report. Selected photos of the dam are contained in Appendix C.

In general, the overall condition of the dam and its appurtenant structures is FAIR.

b. Dam - The dam is an earth embankment with a gravity overflow section. Approximately 195 feet is an earth embankment with the remainder being a spillway. The earth embankment on the southern side is overgrown with small trees and brush (Photos 2 and 3). The northern side is mowed grass (Photo 1). There is a wet spot on the embankment on the southern side (See photo location plan for location). This spot is thought to be due to seepage, though the amount of seepage could not be measured. The horizontal and vertical alignment and condition of the crest of the embankment are good. The upstream face of the embankment on the southern side shows no sign of erosion and is in good condition. The upstream side of the embankment on the northern side of the dam is a concrete retaining wall which is in good condition (Photo 5).

c. Appurtenant Structures - The spillway is 128 feet long and about 3 feet wide. The spillway crest is a concrete weir that changes alignment by about 40° at the center of the spillway (Photos 1 and 2). Half of the downstream face below the spillway is concrete supported by ledge and the remainder is masonry as shown in the Overview Photo. The concrete is on a 1:3 slope,

although on the southern side of the downstream face, the masonry is vertical and there is no ledge (Photos 2 and 7). There is a slight gap where the concrete joins the ledge at one location. This gap is approximately two inches wide, three inches deep and eight feet long and seems to have been caused by erosion of the water flowing over the spillway. Overall the concrete face is in good condition. Two 4-foot concrete abutments on either side of the spillway are also in good condition (Photos 1 and 2).

There is a stone masonry training wall extending from the north side of the spillway for about 70 feet along the downstream channel (Photo 4). There are several locations along the wall where approximately 25 to 30 gpm is seeping at each location (Photo 6). Most of the seepage is probably originating from the sluiceway which runs parallel to the wall (Photo 9). The seepage is clear and shows no sign of particle movement. At these locations there is also some settlement of the ground behind the training wall (Photo 4).

There is a sluiceway gate structure near the north end of the dam (Photo 5). The sluiceway gate is operable, however, the concrete structure is cracking and spalling. The sluiceway to the factory is in good condition with minor spalling of the concrete channel walls (Photo 9).

There is a 24-inch low-level discharge pipe that passes through the base of the dam (Photo 7). Its gate structure is in good condition and the gate is operable (Photo 8).

d. Reservoir Area - The area immediately adjacent to the pond is gently sloped and in a natural state. The shoreline shows no signs of sloughing or erosion. A rise in the water level of the pond would not endanger life or property.

e. Downstream Channel - The downstream channel is natural and lined with rock and gravel. The area adjacent to the downstream channel is overgrown with trees and brush (Photo 10).

3.2 Evaluation

Overall, the general condition of the dam is FAIR. The visual inspection revealed items that led to this assessment, such as:

a. Seepage through the earth embankment.

b. Seepage through and settlement behind the northern spillway training wall.

c. Overgrowth of trees and brush on the earth embankment.

d. Cracking and spalling of the sluice gate inlet structure.

e. Erosion of a gap between the concrete face of the spillway and the ledge.

SECTION 4 - OPERATIONAL AND MAINTENANCE PROCEDURES

4.1 Operational Procedures

a. General - This facility is operated for industrial purposes. The gate and sluiceway are operable and supply water to a factory downstream. The low-level discharge gate is also operable. The gate for the low-level discharge is normally closed and the sluiceway gate is normally open. The low-level discharge was used to lower the pond for maintenance purposes four years ago.

b. Description of Any Warning System in Effect - There is no formal downstream warning system in effect for this dam.

4.2 Maintenance Procedures

a. General - There is no specific maintenance program for this dam.

b. Operating Facilities - The sluiceway gate and low-level discharge gate are both operable.

4.3 Evaluation

There is no regularly scheduled maintenance program. A systematic and complete maintenance program should be instituted at the dam and a formal downstream warning system should be developed.

SECTION 5 - EVALUATION OF HYDRAULIC/HYDROLOGIC FEATURES

5.1 General

The Yantic River Dam is an earth embankment with a gravity overflow section. It has a total length of approximately 323 feet and a maximum height of 18.2 feet. There is a 128 foot long spillway near the northern end of the dam. There is a sluiceway near the northern end of the dam and a low-level discharge pipe through the base of the spillway. The gates to the sluiceway and discharge pipe are operable.

The watershed encompasses 39.4 square miles of rolling topography that is approximately 5 percent natural storage and only about 5 percent developed.

The pond has a capacity of about 39 acre-feet at the spillway crest and approximately 77 acre-feet at the top of the dam.

5.2 Design Data

No design data is available.

5.3 Experience Data

No historical data for recorded discharges or water surface elevations are available for this dam. However, the dam has withstood past major floods such as; September 1938, January and February 1978 and January 1979. The flood of record in this area occurred in September 1938.

5.4 Test Flood Analysis

Based on the Recommended Guidelines for Safety Inspection of Dams, the dam is classified as a SMALL structure with a SIGNIFICANT hazard potential. The test flood for these conditions ranges from the 100 year flood to 1/2 the probable maximum flood. The 100 year flood was used because of the dam's small size.

The test flood inflow was calculated using an equation found in the Connecticut Department of Transportation's Hydraulics and Drainage Manual (1973). This formula was developed for calculating flows throughout the State and is based on USGS gaging stations. The test flood inflow by this method is 6,200 cfs, equivalent to 157 csm. The routing procedure developed by the Corps of Engineers gives an approximate outflow of 6,175 cfs. The spillway capacity of the dam is approximately 2,700 cfs or 40 percent of the test flood outflow. The test flood would overtop the dam by approximately 2 feet.

In order for the Gilman Brothers Company to receive water for manufacturing processes via the sluiceway, the water level in the pond is kept at or above the spillway crest. Therefore, in the routing process effective storage behind the dam was assumed to begin at the elevation of the spillway crest. Storage was determined by an average area depth analysis. Capacity curves for the spillway assumed a broad crested weir.

5.5 Dam Failure Analysis

A dam failure analysis was performed using the Rule of Thumb method in accordance with guidelines established by the Corps of Engineers. Failure was assumed to occur when the water level in the pond was at the top of the dam.

The spillway discharge just prior to dam failure is 2,700 cfs and the calculated dam failure discharge is 12,270 cfs.

Failure of the Yantic River Dam could result in the possible loss of a few lives and cause appreciable property damage (See Photo 10 - Appendix C). Approximately 550 feet downstream from the dam is a factory building located adjacent to the river. This building houses a power plant and maintenance shops. The first floor sill of the building is approximately 9 feet above the streambed. Estimated flow and water depth at this location just prior to dam

failure is 2,700 cfs and 5.9 feet and just after dam failure is 8,230 cfs and 11 feet. The water would rise approximately 2 feet above the first floor sill of the factory building. Also in this area water will be flowing 1.5 to 2 feet deep in the street, however, it will not affect any houses. Approximately 750 feet downstream the floodwave would hit an abandoned building. It is estimated that the water at this building would just reach the first floor sill.

The available mapping and a downstream field inspection indicates there is no hazard potential beyond this point.

SECTION 6 - EVALUATION OF STRUCTURAL STABILITY

6.1 Visual Observations

The general structural stability of the dam is good as evidenced by its vertical, horizontal and lateral alignment. The concrete face of the spillway at the ledge interface appears stable although there is evidence of slight movement and erosion. The earth embankment portions of the dam show no evidence of instability in spite of the steep (1:1) slopes. The structural stability of the embankment could be affected by the seepage as noted in Section 3.2.

The spillway training wall is also in good alignment, however, continued seepage through the wall and the settlement of the earth behind the wall at these locations could lead to structural instability.

6.2 Design and Construction Data

The dam was constructed around 1915. No construction documentation is available for this dam.

6.3 Post-Construction Changes

No information on post-construction changes is available.

6.4 Seismic Stability

The dam is located in Seismic Zone 1 and in accordance with Recommended Phase I Guidelines does not warrant a seismic analysis.

SECTION 7 - ASSESSMENT, RECOMMENDATIONS AND REMEDIAL MEASURES

7.1 Dam Assessment

a. Condition - After considering the available information, the results of the inspection, contacts with the owner and hydraulic/hydrologic computations, the general condition of the Yantic River Dam is assessed as FAIR.

b. Adequacy of Information - The information available was such that an assessment of the safety of the dam was based on the available data, the visual inspection results and computations developed for this report.

c. Urgency - It is suggested that the recommendations and remedial measures listed below be implemented within one year after receipt of this Phase I Inspection Report.

7.2 Recommendations

The following recommendations should be carried out under the direction of a qualified registered engineer:

a. Seepage through the earth embankment and the spillway training wall should be investigated to determine its origin and monitored to determine any changes.

b. The settlement of the earth behind the northern spillway training wall should be investigated to determine its effect on the structural stability of the northern abutment and should be monitored to determine any changes.

c. Trees, including stumps and root systems, should be removed from within 20 feet of the toe, embankment slopes and crest and backfilled with proper material.

d. Perform a detailed hydrologic/hydraulic investigation to assess further the potential of overtopping the dam it's ability to withstand overtopping and the need for and the means to increase project discharge capacity.

7.3 Remedial Measures

a. Operation and Maintenance Procedures -

(1) Limit the growth of brush on the embankment slopes and in the downstream channel by periodic removal and maintenance.

(2) Grass on the embankment should be maintained at a good length to protect it from erosion and facilitate inspection.

(3) Repair the cracked and spalled concrete at the sluiceway gate structure and fill the gap at the ledge/concrete interface of the spillway.

(4) Institute a program of annual technical inspection by a qualified engineer at which time the low-level discharge pipe should be operated.

(5) Develop plans for surveillance during periods of unusually heavy rains and institute a formal downstream warning system for use in the event of an emergency.

7.4 Alternatives

There are no practical alternatives to the above recommendation.

APPENDIX A

INSPECTION CHECK LIST

INSPECTION CHECK LIST

PARTY ORGANIZATION

PROJECT Yantic River Dam

DATE 11/5/80

TIME 9:00 a.m.

WEATHER Sunny, 50's

W.S. ELEV._____ U.S.____ DN.S.

PARTY:

1. Gary Giroux, S.E., Hyd./Struct.
2. Herman Hani, S.E., Technician
3. Ben Cohen, S.E. Civil
4. Mike Pozzato, MA, Mechanical
5. Peter Austin, DBA, Civil
6. Mike Quatromoni, DBA, Civil
7.
8.
9.
10.

PROJECT FEATURE	INSPECTED BY	REMARKS
1. Dam Embankment	P. Austin M. Quatromoni	Fair
2. Mechanical	M. Pozzato	Good
3. Spillway	G. Giroux B. Cohen	Good
4. Discharge Channel	G. Giroux H. Hani	Fair
5.		
6.		
7.		
8.		
9.		
10.		

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITIONS
DAM EMBANKMENT	
Crest Elevation	234 (NGVD)
Current Pool Elevation	230 (NGVD)
Maximum Impoundment to Date	Unknown
Surface Cracks	Minor spalling where concrete face joins ledge
Pavement Condition	N/A
Movement or Settlement of Crest	None
Lateral Movement	None
Vertical Alignment	Good
Horizontal Alignment	Good
Condition at Abutment and at Concrete Structures	Fair
Indications of Movement of Structural Items on Slopes	None
Trespassing on Slopes	No evidence
Vegitation on Slopes	Light grass on northern side, trees and brush on southern side
Sloughing or Erosion of Slopes or Abutments	None
Rock Slope Protection - Riprap Failures	N/A
Unusual Movement or Cracking at or near Toes	None
Unusual Embankment or Downstream Seepage	Minor seepage through southern embankment
Piping or Boils	None
Foundation Drainage Features	None
Toe Drains	None
Instrumentation System	None

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - INTAKE CHANNEL AND INTAKE STRUCTURE	
a. Approach Channel	Underwater
Slope Conditions	
Bottom Conditions	
Rock Slides or Falls	
Log Boom	
Debris	
Condition of Concrete Lining	
Drains or Weep Holes	
b. Intake Structure	
Condition of Concrete	Good
Stop Logs and Slots	None

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - CONTROL TOWER	N/A
a. Concrete and Structural	"
General Condition	"
Condition of Joints	"
Spalling	"
Visible Reinforcing	"
Rusting or Staining of Concrete	"
Any Seepage or Efflorescence	"
Joint Alignment	"
Unusual Seepage or Leaks in Gate Chamber	"
Cracks	"
Rusting or Corrosion of Steel	"
b. Mechanical and Electrical	"
Air Vents	"
Float Wells	"
Crane Hoist	"
Elevator	"
Hydraulic System	Operable
Service Gates	
Emergency Gates	
Lightning Protection System	
Emergency Power System	
Wiring and Lighting System in Gate Chamber	

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - TRANSITION AND CONDUIT	N/A
General Condition of Concrete	"
Rust or Staining on Concrete	"
Spalling	"
Erosion or Cavitation	"
Cracking	"
Alignment of Monoliths	"
Alignment of Joints	"
Numbering of Monoliths	"

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SPILLWAY WEIR, APPROACH AND DISCHARGE CHANNELS	
a. Approach Channel	
General Condition	Unknown - underwater
Loose Rock Overhanging Channel	None
Trees Overhanging Channel	Not a problem
Floor of Approach Channel	Underwater
b. Weir and Training Walls	
General Condition of Concrete	Fair
Rust or Staining	None
Spalling	None
Any Visible Reinforcing	None
Any Seepage or Efflorescence	Several locations along northern training wall
Drain Holes	None
c. Discharge Channel	
General Condition	Good
Loose Rock Overhanging Channel	Loose stones in northern training wall
Trees Overhanging Channel	None
Floor of Channel	Good
Other Obstructions	

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - OUTLET STRUCTURE AND OUTLET CHANNEL	
General Condition of Concrete	
Rust or Staining	
Spalling	
Erosion or Cavitation	
Visible Reinforcing	
Any Seepage or Efflorescence	
Condition at Joints	
Drain holes	
Channel	Outlet pipe discharges into spillway channel
Loose Rock or Trees Overhanging Channel	
Condition of Discharge Channel	

INSPECTION CHECK LIST

PROJECT Yantic River Dam DATE 11/5/80

PROJECT FEATURE _____ NAME _____

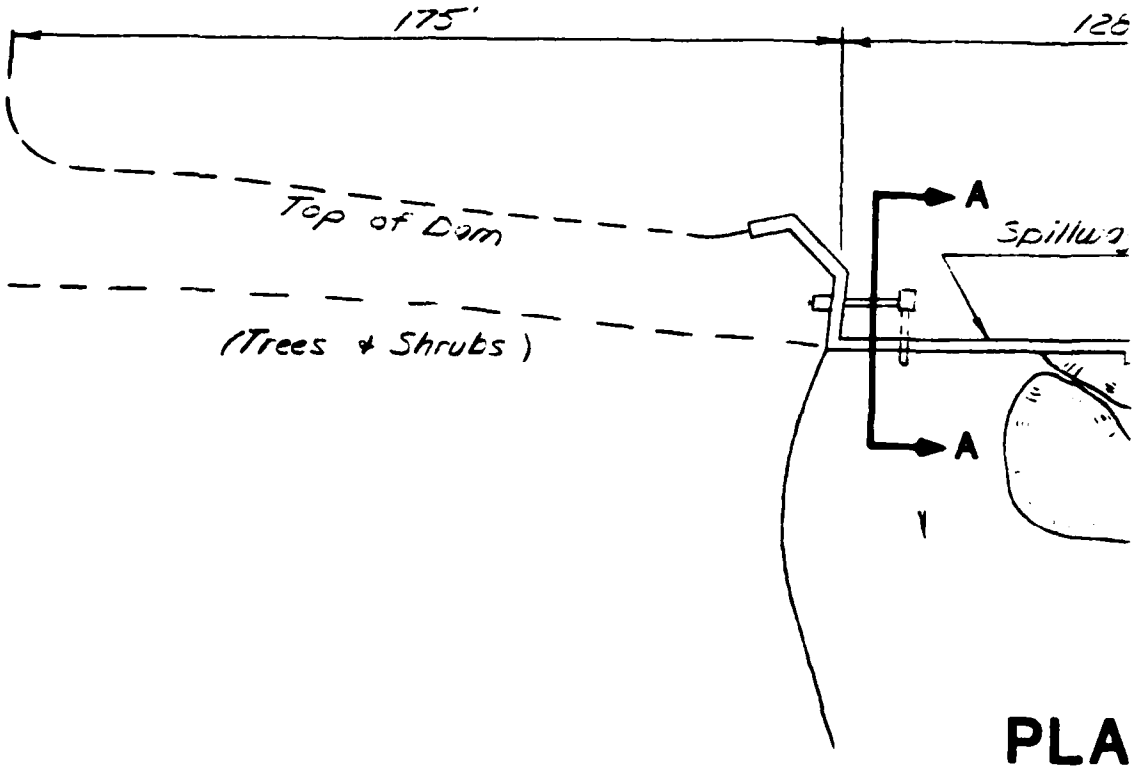
DISCIPLINE _____ NAME _____

AREA EVALUATED	CONDITION
OUTLET WORKS - SERVICE BRIDGE	N/A
a. Super Structure	"
Bearings	"
Anchor Bolts	"
Bridge Seat	"
Longitudinal Members	"
Under Side of Deck	"
Secondary Bracing	"
Deck	"
Drainage System	"
Railings	"
Expansion Joints	"
Paint	"
b. Abutment & Piers	"
General Condition of Concrete	"
Alignment of Abutment	"
Approach to Bridge	"
Condition of Seat & Backwall	"

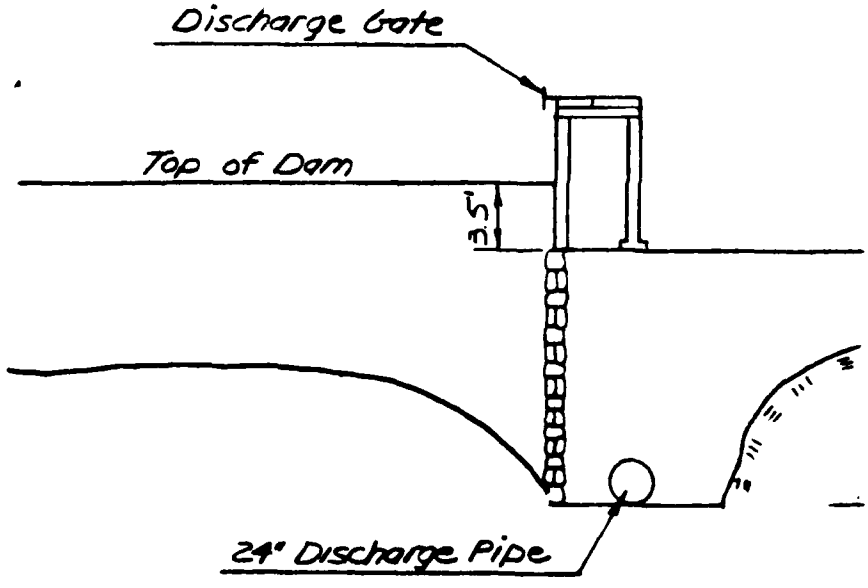
APPENDIX B

ENGINEERING DATA

GILMAN POND

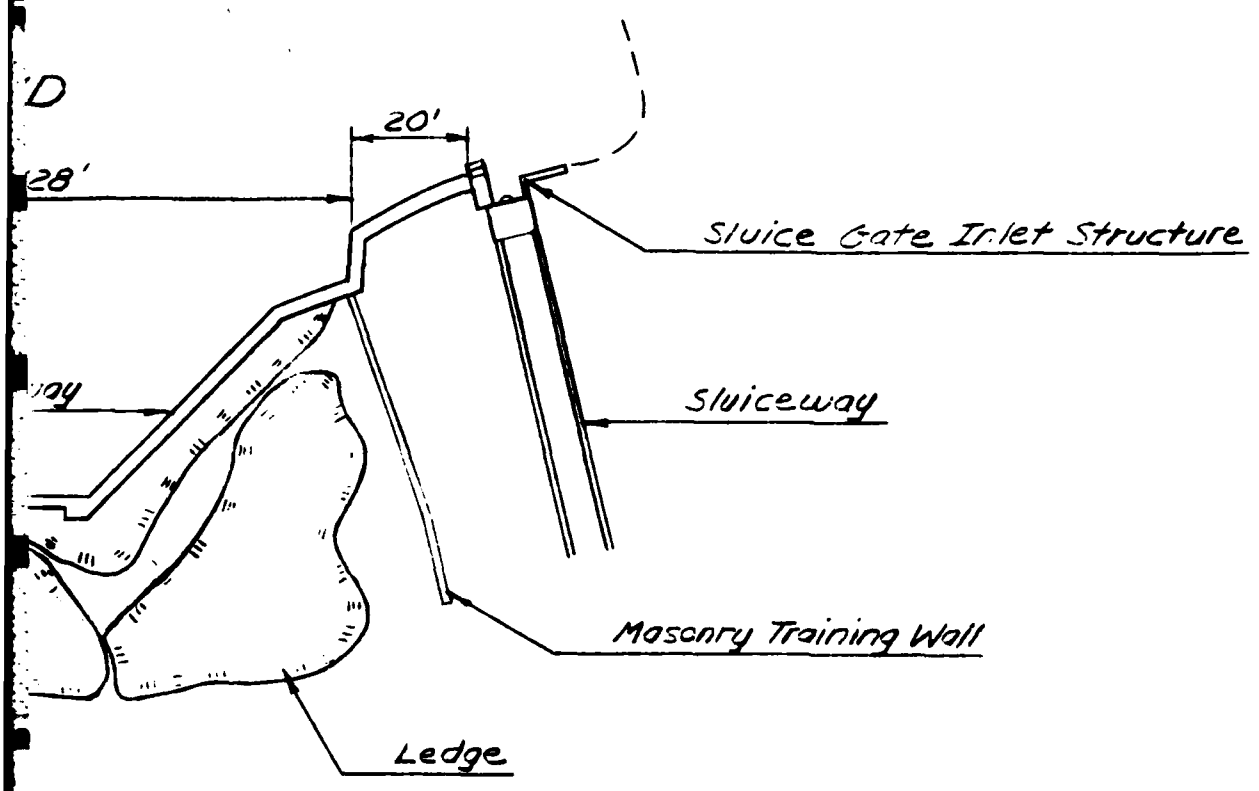


PLA



ELEVAT

'D



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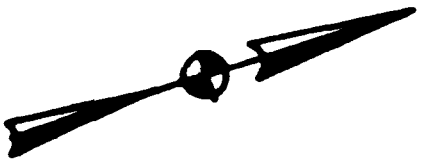
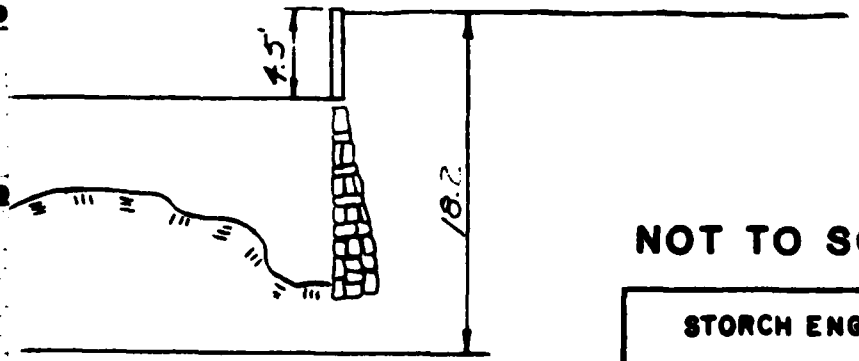




TION

NOT TO SCALE

PLATE 1

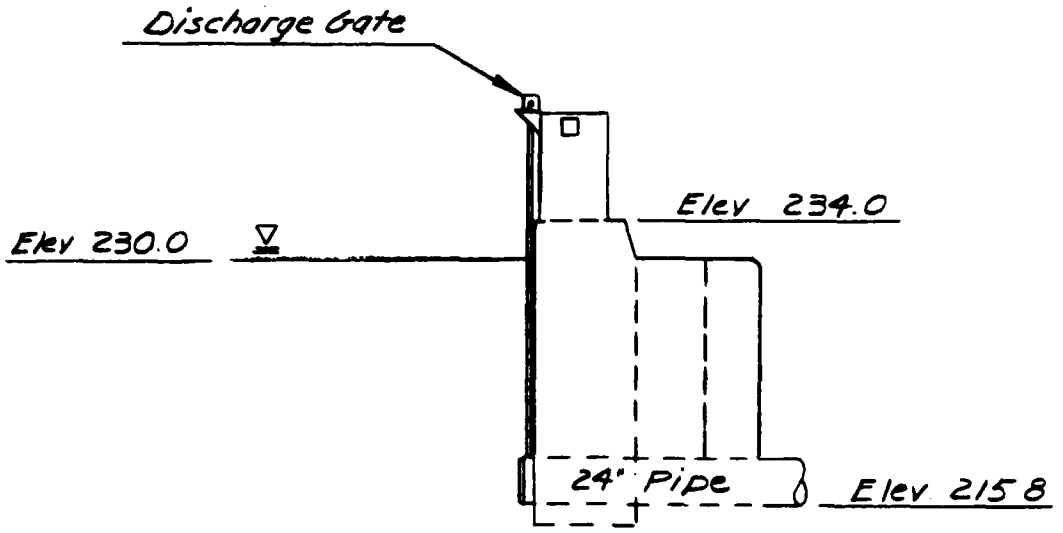
STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

YANTIC RIVER DAM

SCALE: AS SHOWN

DATE: MARCH 1981



SECTION A-A

PLATE 2

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

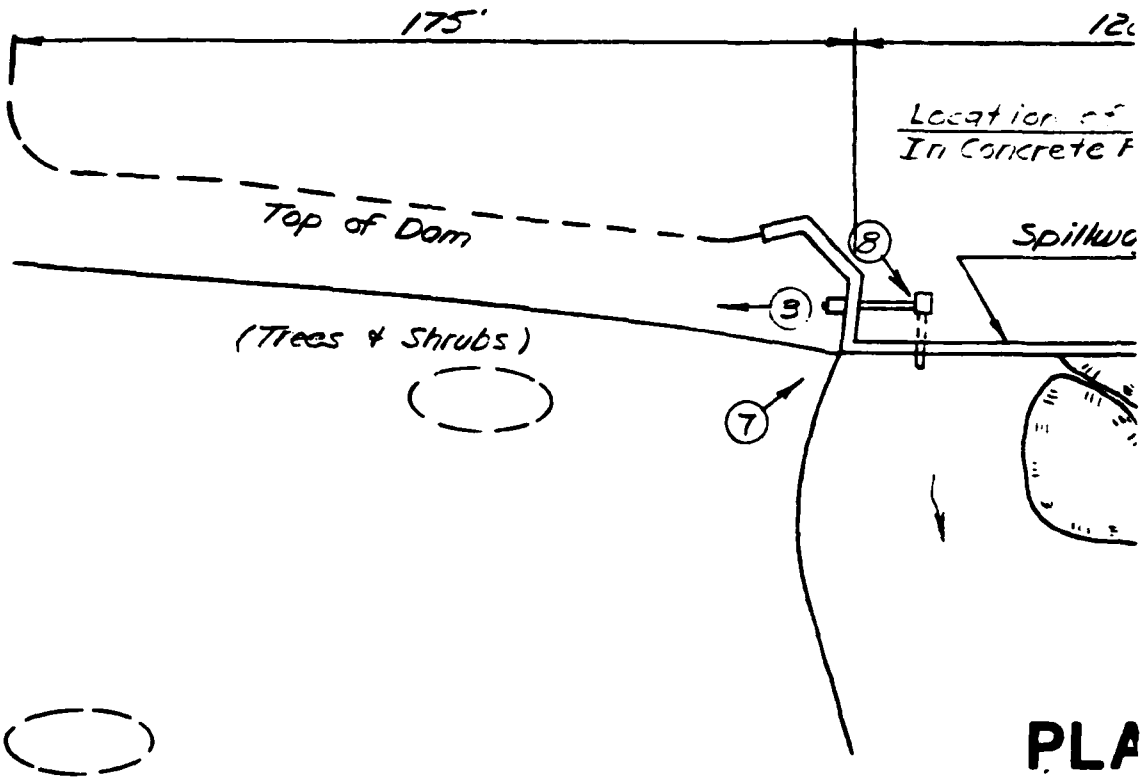
YANTIC RIVER DAM

NOT TO SCALE

SCALE · AS SHOWN

DATE MARCH 1981

GILMAN POND



PLA

Denotes Seepage

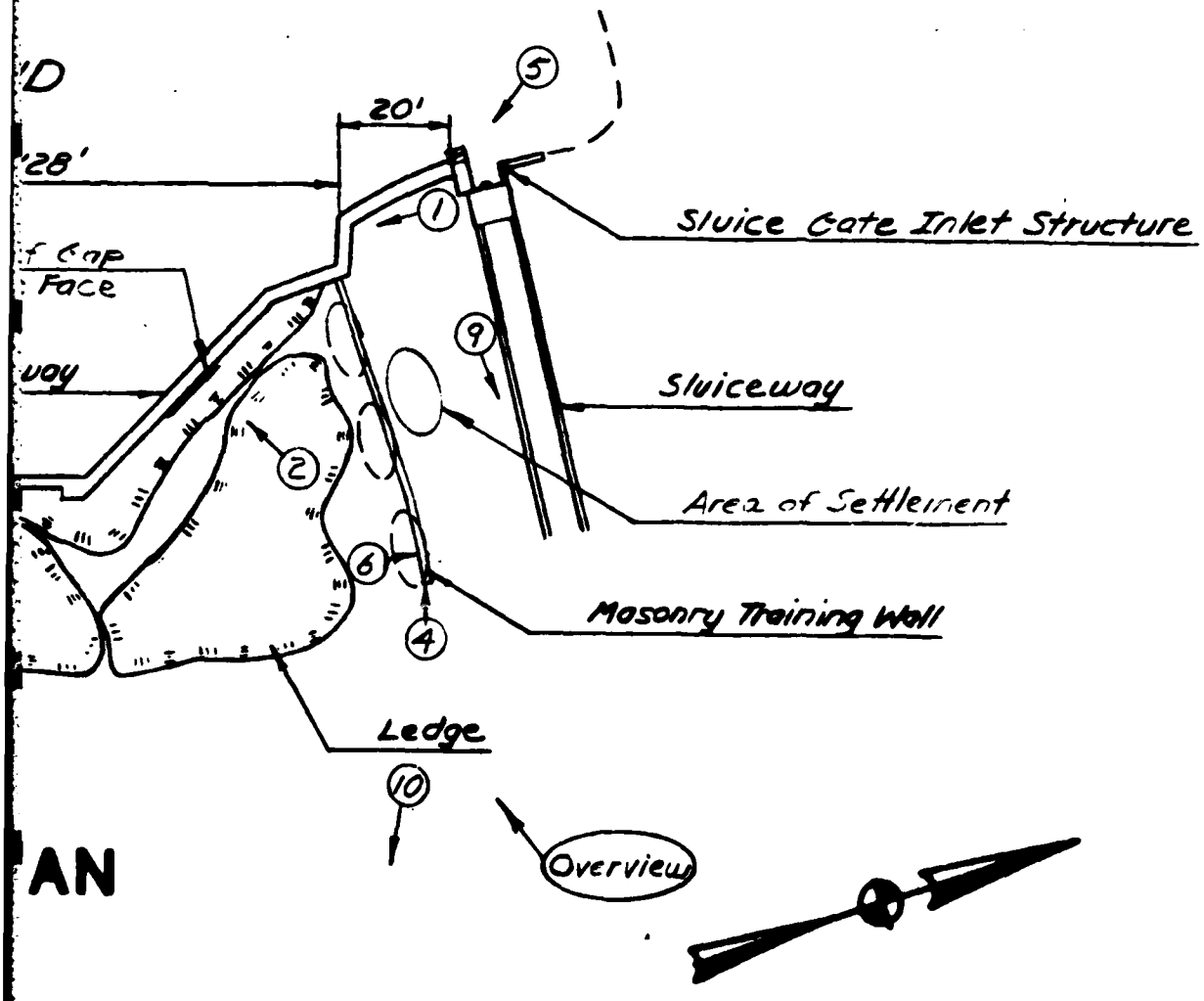


PHOTO LOCATION PLAN

PLATE 3

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV. NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

YANTIC RIVER DAM

2

NOT TO SCALE

			SCALE: AS SHOWN
			DATE: MARCH 1981

PHOTO 1

CREST OF DAM - LOOKING SOUTH

PHOTO 2

SPILLWAY CREST

PHOTO 3

CREST OF DAM - LOOKING SOUTH

PHOTO 4

NORTH SPILLWAY TRAINING WALL

PHOTO 5

INLET STRUCTURE - SLUICEWAY

PHOTO 6

SEEPAGE - NORTH SPILLWAY TRAINING WALL

PHOTO 7

DISCHARGE PIPE

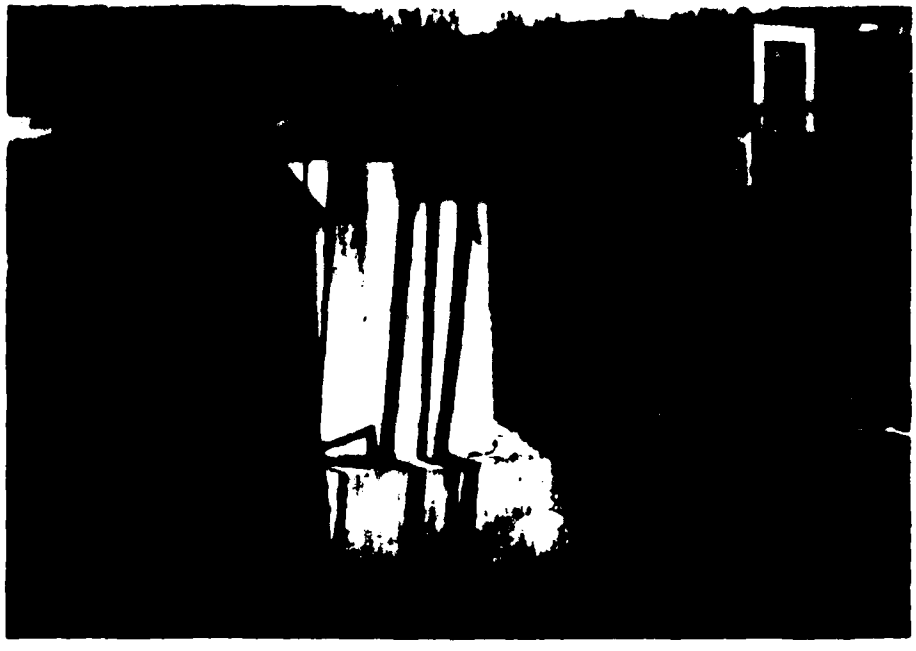


PHOTO 8

CONTROL GATE

PHOTO 9

SLUICEWAY - LOOKING DOWNSTREAM

PHOTO 10

DOWNSTREAM CHANNEL

APPENDIX D

HYDRAULIC/HYDROLOGIC COMPUTATIONS

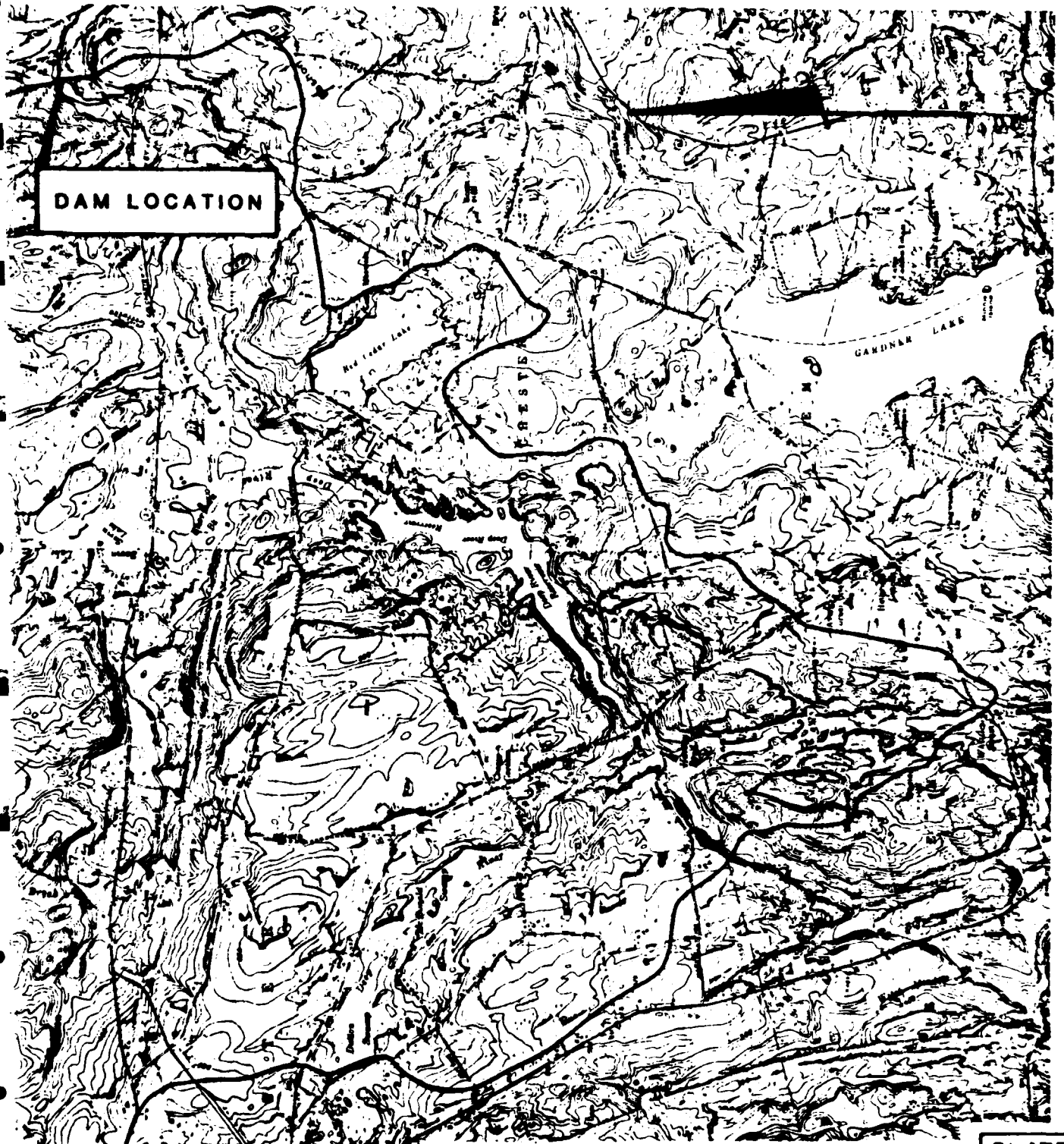


PLATE 4

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U.S. ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS

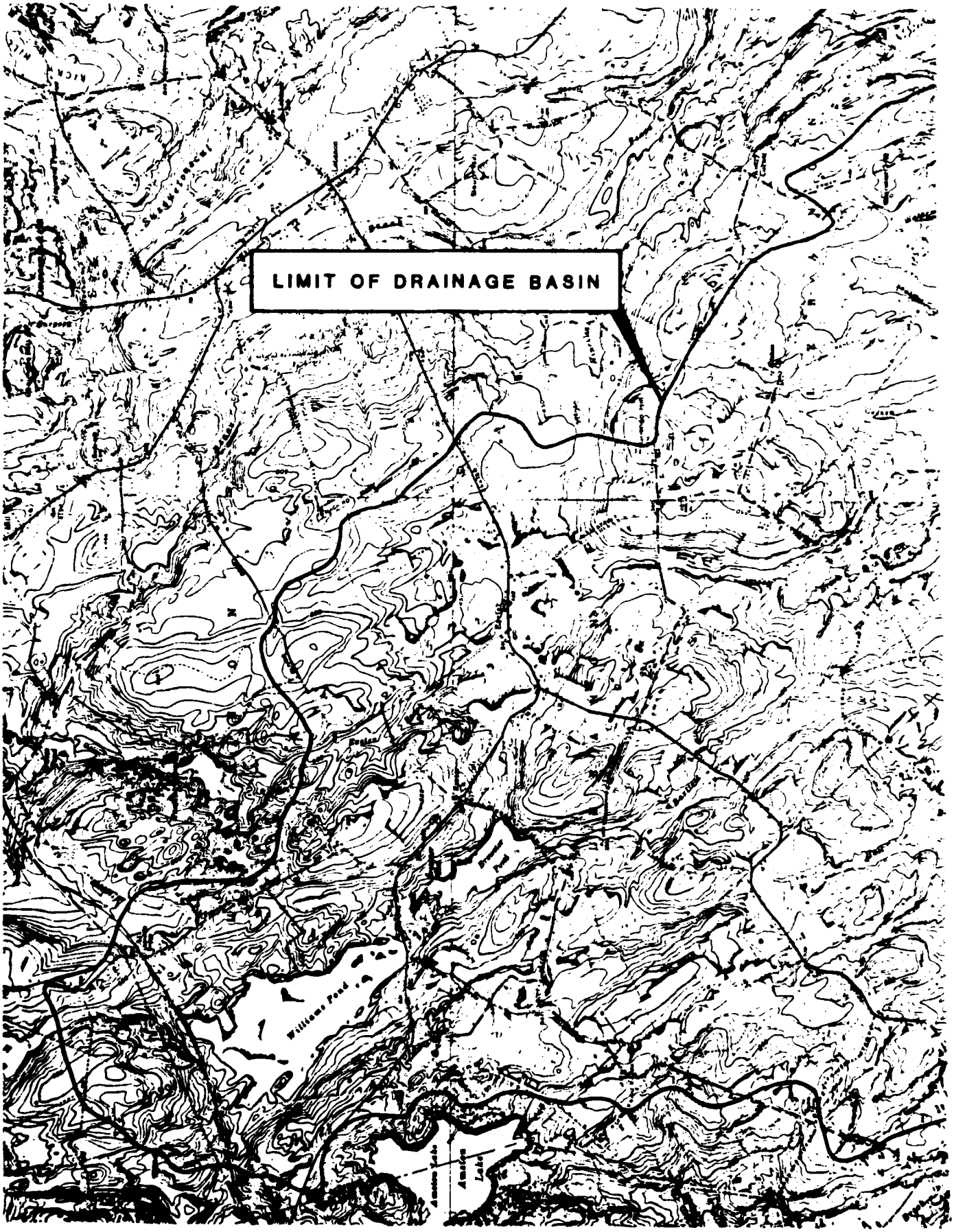
NATIONAL PROGRAM OF INSPECTION OF NON-FED. DAMS

YANTIC RIVER DAM

1:48000

SCALE AS SHOWN

DATE MARCH 1981


LIMIT OF DRAINAGE BASIN

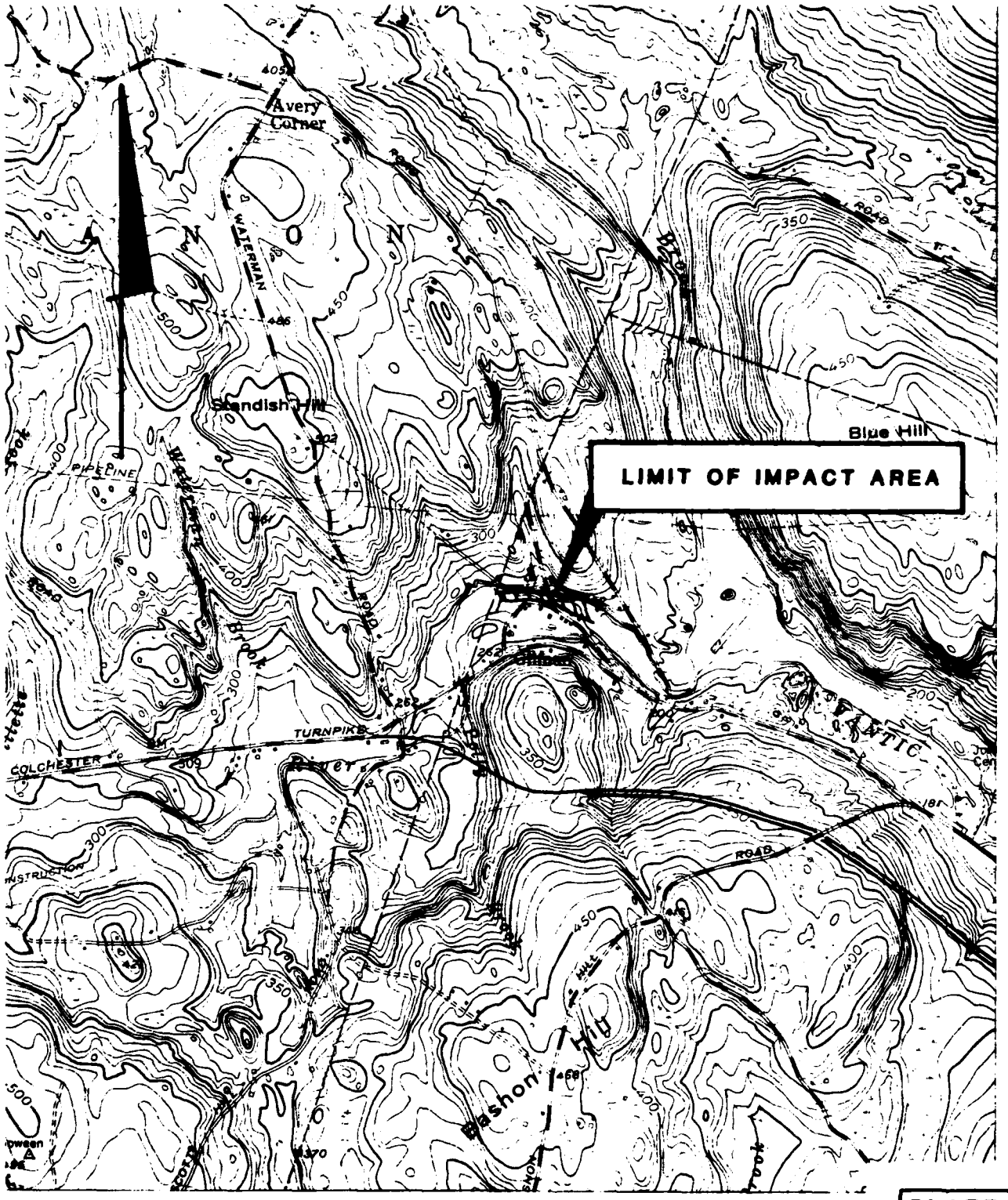


PLATE 5

STORCH ENGINEERS WETHERSFIELD, CONNECTICUT	U S ARMY ENGINEER DIV NEW ENGLAND CORPS OF ENGINEERS WALTHAM MASS.

NATIONAL PROGRAM OF INSPECTION OF NON-FED DAMS

YANTIC RIVER DAM

1:24000

SCALE AS SHOWN

DATE MARCH, 1981

STORCH ENGINEERS
Engineers - Landscape Architects
Planners - Environmental Consultants

JOB Phase I Dam Inspection - #4463
SHEET NO _____ OF _____
CALCULATED BY RDC DATE 1/5/81
CHECKED BY AJK DATE 1/14/81

Determination of Test Flood

NAME OF DAM Yantic River Dam

DRAINAGE AREA 39.4 SM

INFLOW Size: Small Hazard: Significant Test Flood: 100 year

$Q_{100} = 340A^{.79}$
$Q_{100} = 340(39.4)^{.79} = 6,193$ cfs

Estimating the effect of surcharge storage on the Maximum Test Flood

1. Q_{P1} = 6200 cfs
2a. H_1 = 5.9' (elev.)
b. $STOR_1$ = .02"
c. $Q_{P2} = Q_{P1}(1 - STOR_1/4.9)$ * = 6,174 cfs
3a. H_2 = 5.9' $STOR_2$ = .02"
b. $STOR_A$ = .02"
Q_{PA} = 6175
H_A = 5.9' $STOR_A$ = .02"

Test Flood = 6,175 cfs

Capacity of the spillway when the pond elevation is at the top of the dam

Q = 2700 cfs or 43.7 % of the Test Flood

* El. 9 - 150 [illegible]

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Planners - Environmental Consultants

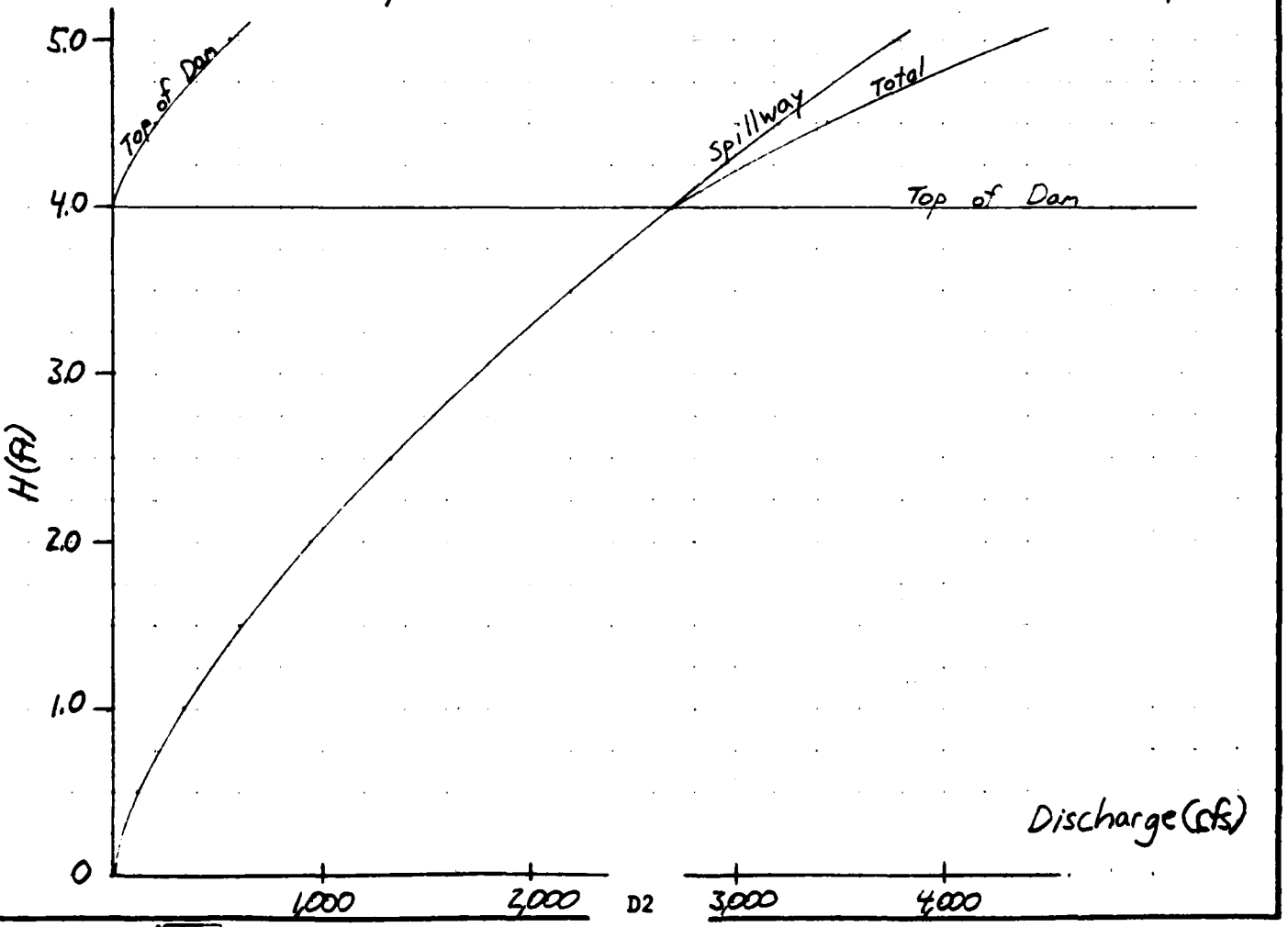
JOB Phase I Dam Inspection 4463
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 11/24/81
CHECKED BY GJG DATE 1/14/81

Stage Discharge

NAME OF DAM Yantic River Dam

$Q = CLH^{3/2}$

	Spillway I				Spillway II				Dam				
Elev	C	L	H	Q	C	L	H	Q	C	L	H	Q	QT
		128	0	0									0
	2.70		0.5	122									244
	2.63		1.0	337									337
	2.64		1.5	618									618
	2.63		2.0	952									952
	2.63		2.5	1,331									1,331
			3.0	1,749									1,749
			3.5	2,204									2,204
			4.0	2,693						215	0	0	2,693
			4.5	3,213					2.70		0.5	205	3,418
			5.0	3,764					2.63		1.0	565	4,329



D2

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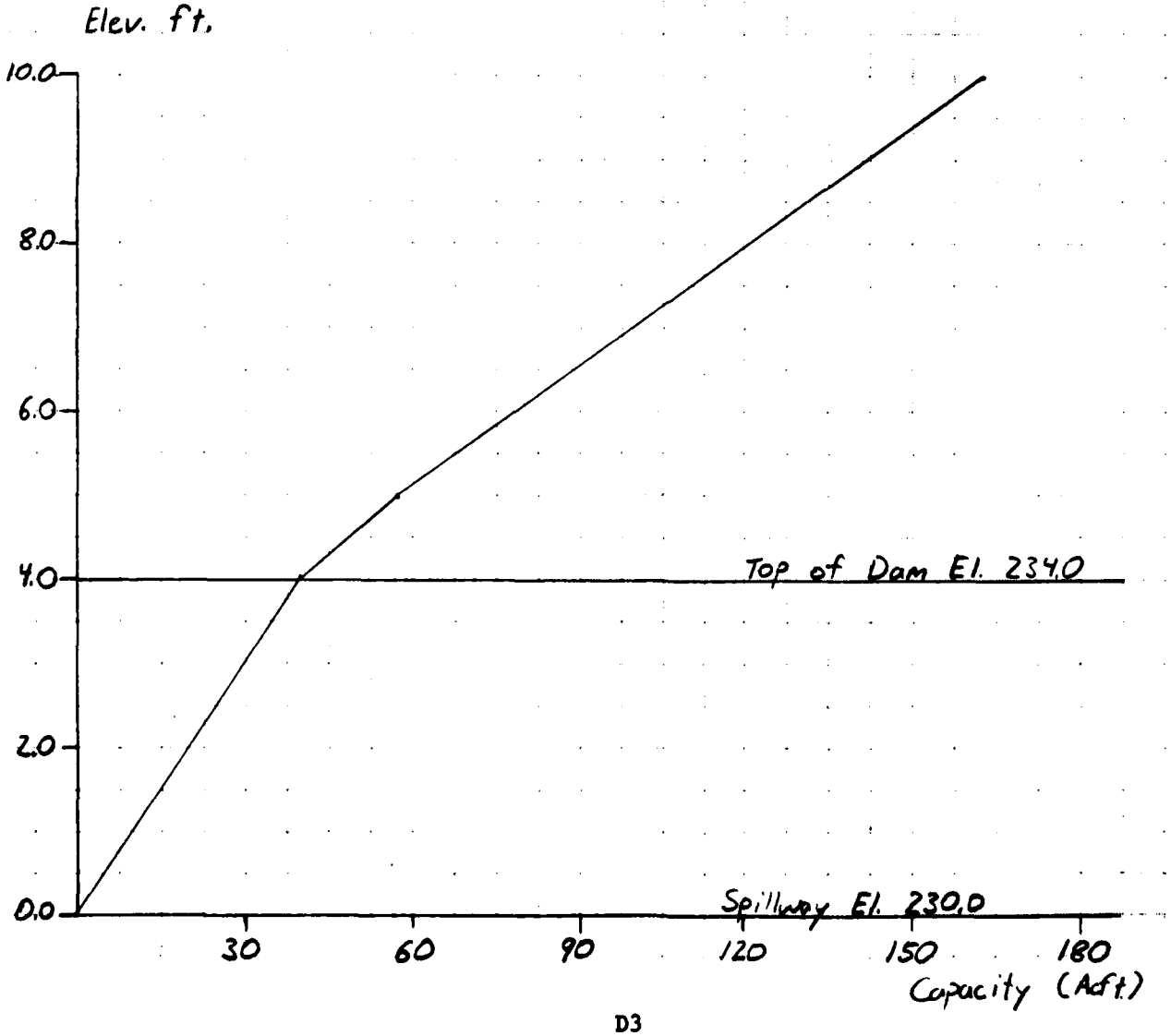
JOB Phase I Dam Inspection 4463
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 1/5/81
CHECKED BY EJG DATE 1/11-1/81

AREA - CAPACITY

Name of Dam: Yantic River Dam

ELEV	DEPTH	AREA	AVG. AREA	VOL	Σ VOL
0.0		4.3			0.0
	5.0		11.4	57.0	
5.0		18.5			57.0
	5.0		21.0	105.0	
10.0		23.5			162.0

Storage below spillway is approximately 39.4 Ac ft



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JOB Phase I Dam Inspection - #4463
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 11/18/80
CHECKED BY Ken DATE 11/21/80
Downstream Hydrographs

"Rule of Thumb" Guidance for Estimating Downstream Failure Hydrographs

NAME OF DAM Yantic River Dam

Section I at Dam

1. $S = \underline{770}$ Acft
2. $Q_{P1} = 8/27\ W_b \sqrt{g}\ Y^{3/2} = 8/27(94)\sqrt{32.2}(18.2)^{1.5} = 12,270$
3. See Sections

Section II at

4a. $H_2 = \underline{14.3'}$ $A_2 = \underline{2,800}$ $L_2 = \underline{250}$ $V_2 = \underline{16.1}$ Acft

b. $Q_{P2} = Q_{P1}(1-V_2/S) = \underline{9700}$ cfs

c. $H_2 = \underline{13.2'}$ $A_2 = \underline{2,280}$

$A_A = \underline{2540}$ $V_2 = \underline{14.5}$ Acft

$Q_{P2} = 12,270(1-14.5/77.1) = 9,960$ $H = 13.4'$

Section III at

4a. $H_3 = \underline{11.7'}$ $A_3 = \underline{1,390}$ $L_3 = \underline{210}$ $V_3 = \underline{6.7}$ Acft

b. $Q_{P3} = Q_{P2}(1-V_3/S) = \underline{9090}$ cfs

c. $H_3 = \underline{11.4'}$ $A_3 = \underline{1,250}$

$A_A = \underline{1730}$ $V_3 = \underline{8.4}$ Acft

$Q_{P3} = 9,960(1-8.4/77) = 8,870$ $H = 11.3'$

Section IV at

4a. $H_4 = \underline{10.7}$ $A_4 = \underline{640}$ $L_4 = \underline{250}$ $V_4 = \underline{3.9}$ Acft

b. $Q_{P4} = Q_{P3}(1-V_4/S) = \underline{2,420}$ cfs

c. $H_4 = \underline{10.4'}$ $A_4 = \underline{610}$

$A_A = \underline{1202}$ $V_4 = \underline{6.9}$ Acft

$Q_{P4} = 8,870(1-6.9/77) = 8875$ $H = 10.1'$

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Planners - Environmental Consultants

JOB Phase I Dam Inspection - #4463
SHEET NO _____ OF _____
CALCULATED BY BDC DATE 11/18/80
CHECKED BY Ken DATE 11/21/80
Downstream Hydrographs (Continued)

Section V at

4a. H_5 = 10.8' A_5 = 1,860 L_5 = 110 V_5 = 4.7 Acft

b. $Q_{P5} = Q_{P4}(1-V_5/S)$ = 8833 cfs

c. H_5 = 10.5' A_5 = 1,700

A_A = 1,494 V_5 = 3.8 Acft

Q_{P5} = 8875(1-3.8/77) = 8470 H = 10.6'

Section VI at

4a. H_6 = 10.6' A_6 = 1,740 L_6 = 250 V_6 = 10.0 Acft

b. $Q_{P6} = Q_{P5}(1-V_6/S)$ = 7340 cfs

c. H_6 = 9.9' A_6 = 1,522

A_A = 1,532 V_6 = 8.8 Acft

Section VI$ at 8440(1-8.8/77) = 7475 H = 10.0'

4a. H_7 = _____ A_7 = _____ L_7 = _____ V_7 = _____ Acft

b. $Q_{P7} = Q_{P6}(1-V_7/S)$ = _____ cfs

c. H_7 = _____ A_7 = _____

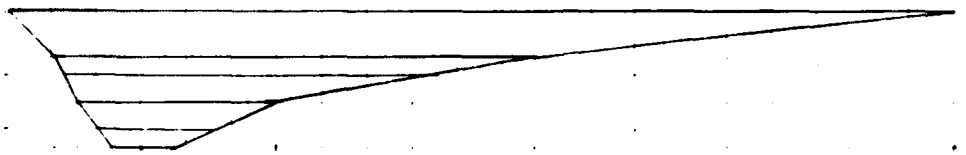
A_A = _____ V_7 = _____ Acft

Q_{P7} =

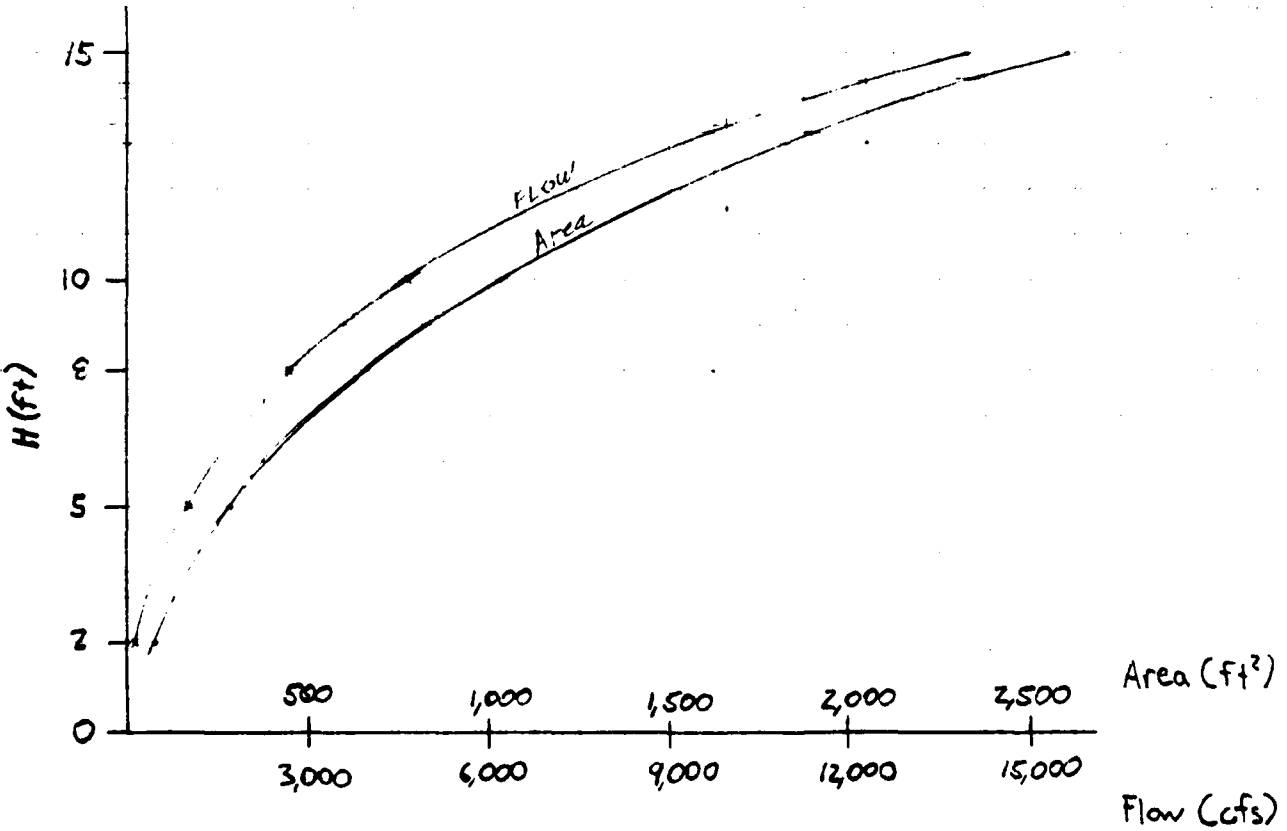
STORCH ENGINEERS - STORCH ASSOCIATES
Engineers - Landscape architects
Planners - Environmental Consultants

JOB Gilman Pond Dam
SHEET NO. ____ OF ____
CALCULATED BY BJC DATE 11/18/80
CHECKED BY Keet DATE 11/21/80
SCALE Section II

$S = 2.22\%$
$n = 0.14$



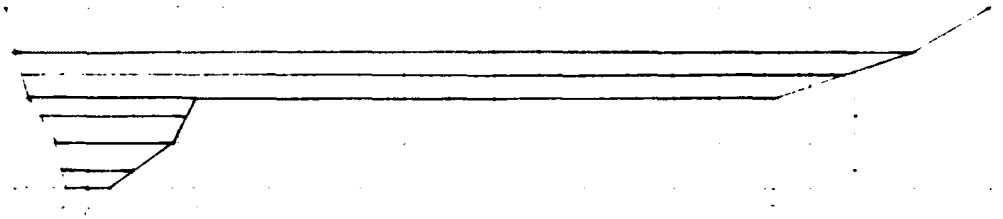
D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	52	77	1.48	1.30	0.149	2.06	159
5	87	286	3.29	2.21	"	3.51	1,003
8	160	657	4.11	2.56	"	4.07	2,673
10	212	1,029	4.85	2.87	"	4.55	4,680
15	416	2,599	6.25	3.39	"	5.38	13,987



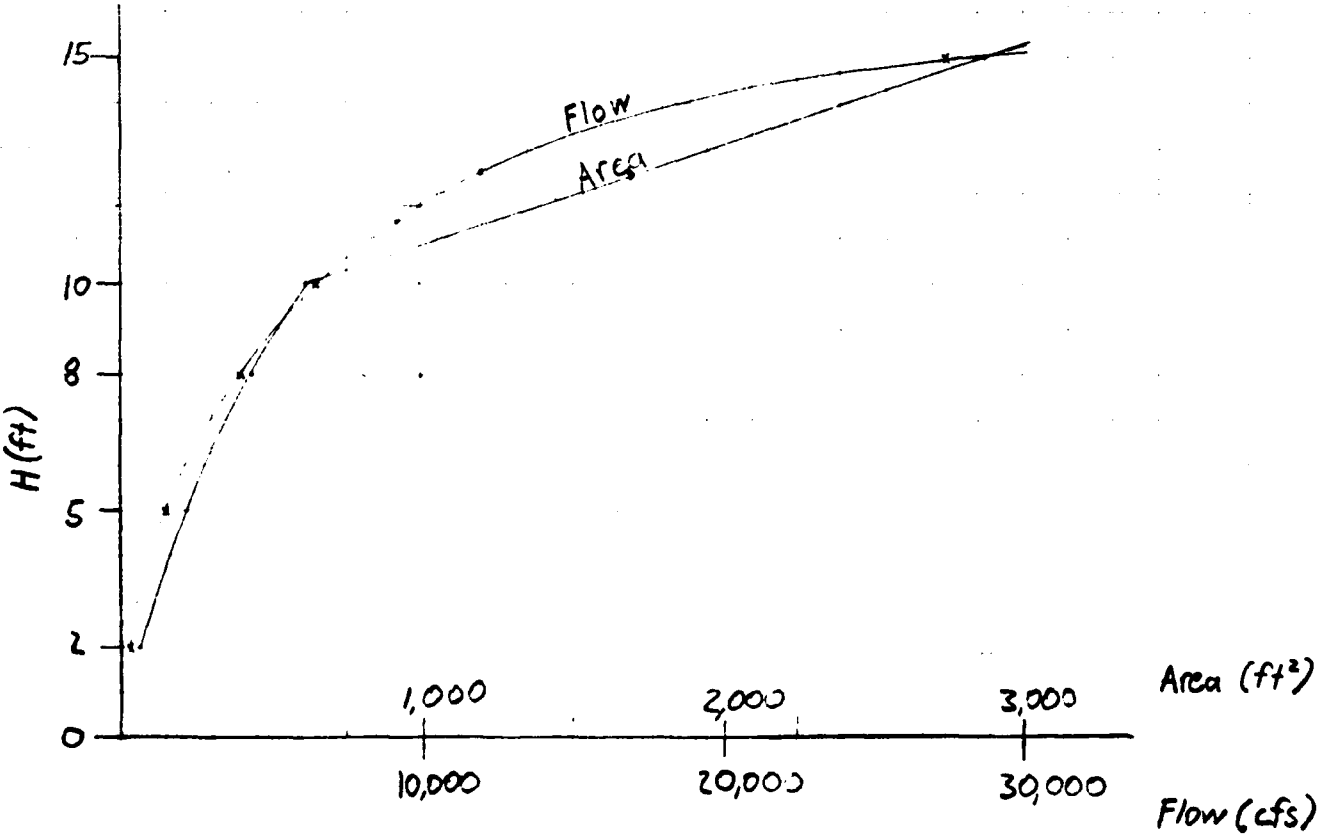
STORCH ENGINEERS - STORCH ASSOCIATES
Engineers - Landscape architects
Planners - Environmental Consultants

JOB Gilman Pond Dam
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 11/18/80
CHECKED BY _____ DATE 11/21/80
SCALE Section III

S = 2.22%
n = 0.075



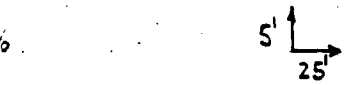
D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	39	65	1.67	1.41	0.149	4.16	271
5	64	220	3.44	2.28	"	6.75	1,484
8	80	436	5.45	3.10	"	9.17	3,999
10	91	607	6.67	3.54	"	10.49	6,370
12.5	455	1,688	3.71	2.40	"	7.09	11,975
15	496	2,872	5.79	3.22	"	9.55	27,413

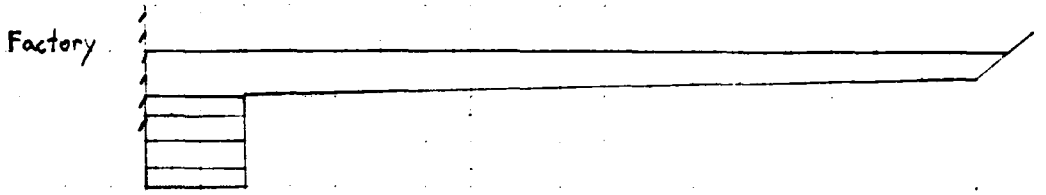


STORCH ENGINEERS - STORCH ASSOCIATES
Engineers - Landscape architects
Planners - Environmental Consultants

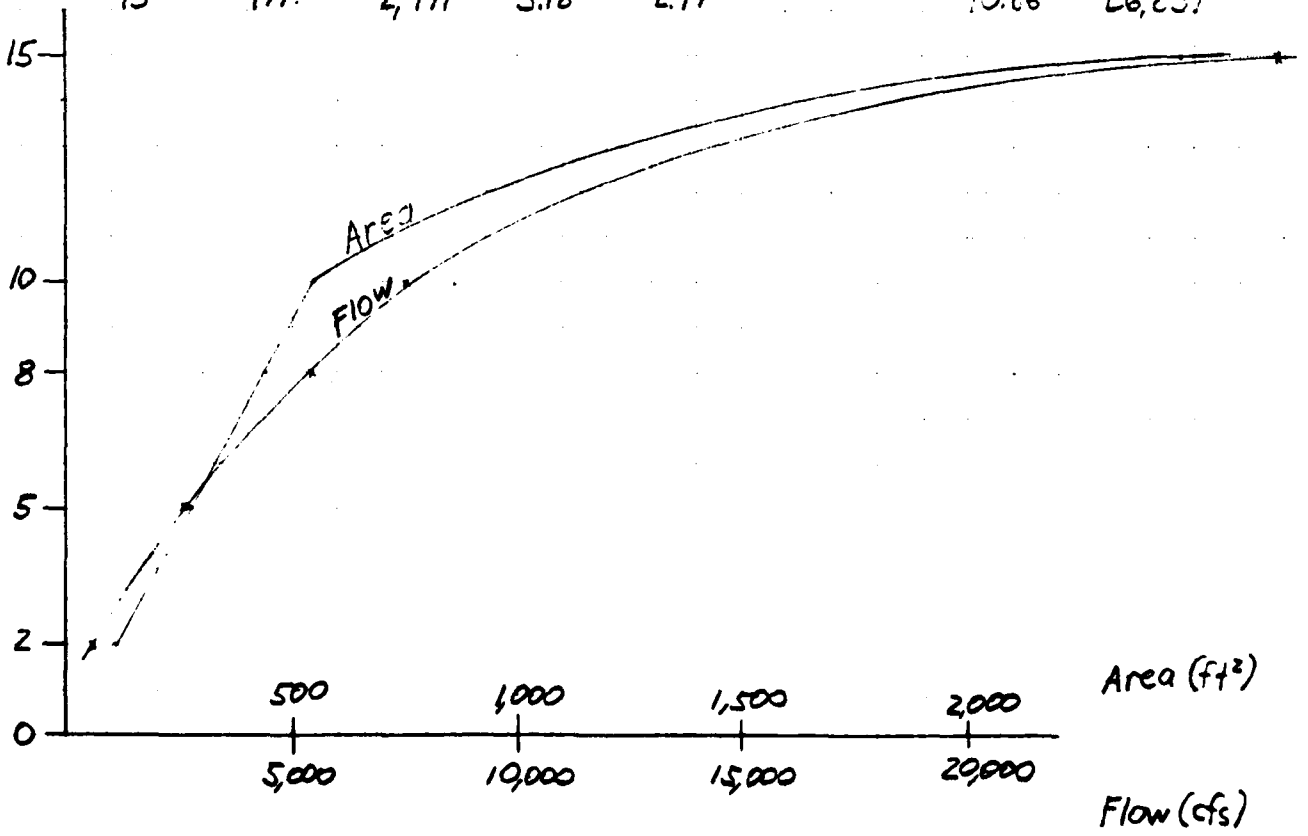
JOB Gilman Pond Dam
SHEET NO. ____ OF ____
CALCULATED BY 3DC DATE 11/18/80
CHECKED BY KHC DATE 11/21/80
SCALE Section III

n = 0.04
S = 0.95%





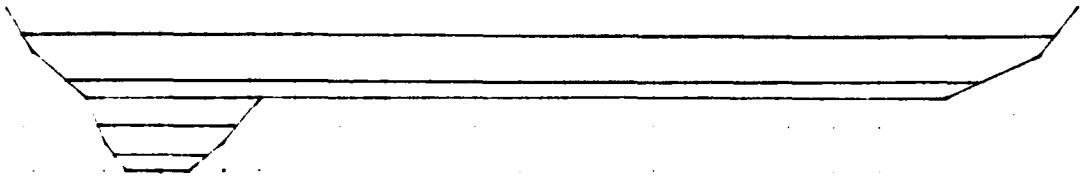
D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	59	110	1.86	1.51	0.0975	5.50	605
5	65	275	4.23	2.62	"	9.50	2,611
8	71	440	6.20	3.37	"	12.25	5,390
10	75	550	7.33	3.77	"	13.70	7,537
15	477	2,471	5.18	2.99	"	10.86	26,859



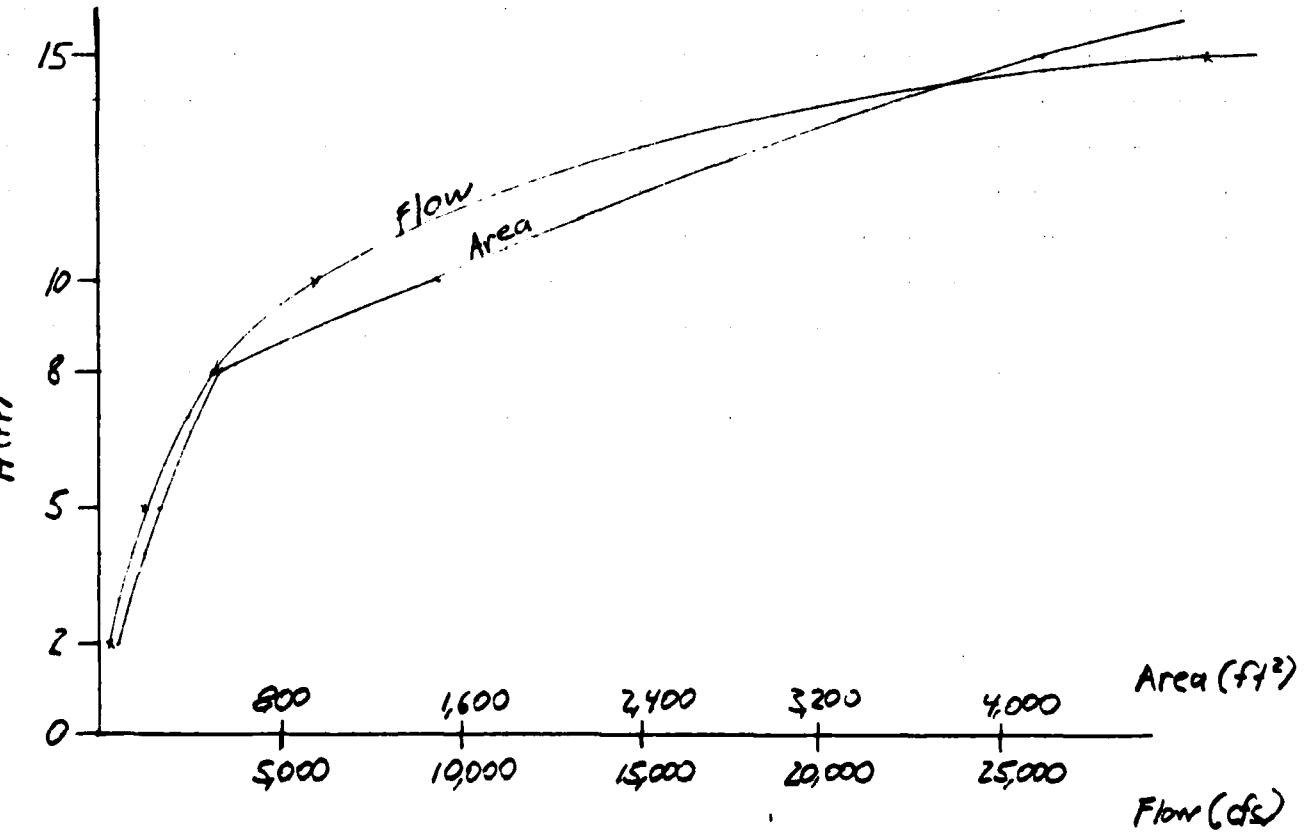
STORCH ENGINEERS - STORCH ASSOCIATES
Engineers - Landscape architects
Planners - Environmental Consultants

JOB Gilman Pond Dam
SHEET NO. _____ OF _____
CALCULATED BY BDC DATE 11/18/80
CHECKED BY Ken DATE 11/21/80
SCALE Section II & VI

$S = 0.95\%$
$n = 0.075$

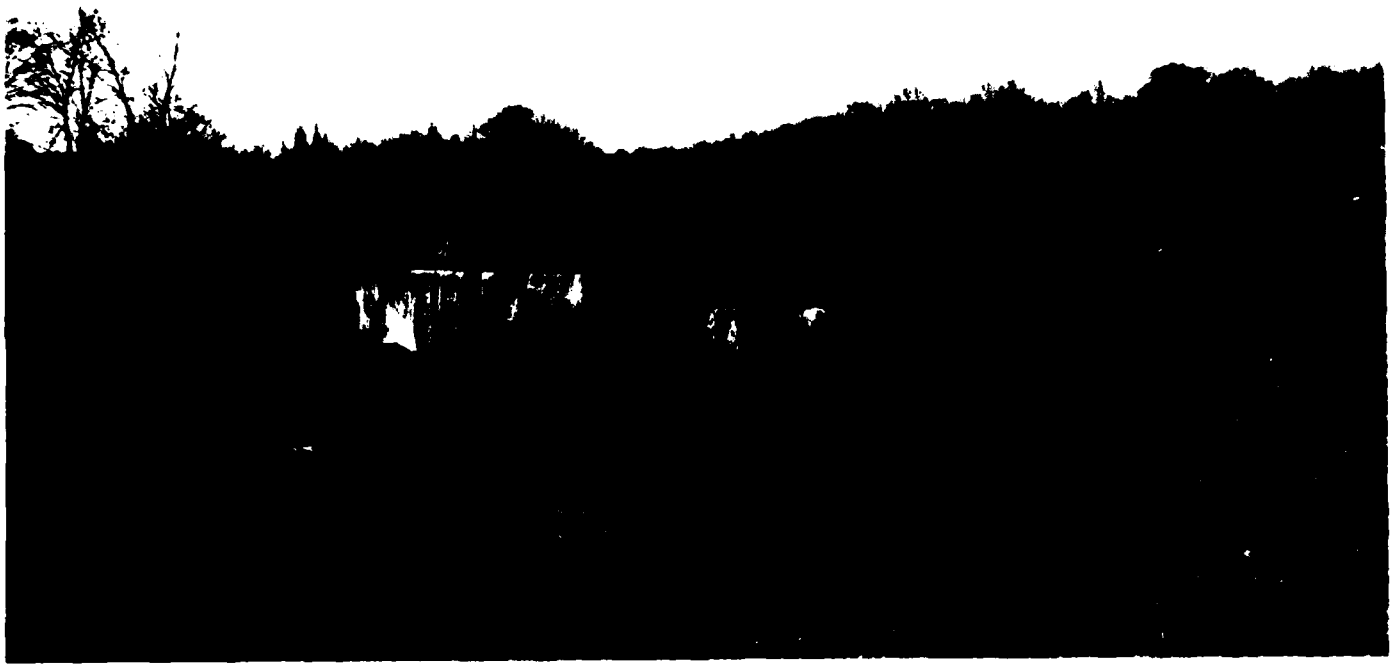


D	WP	A	R	$R^{2/3}$	$S^{1/2}$	V	Q
2	50	85	1.70	1.42	0.0975	2.76	234
5	75	273	3.64	2.37	"	4.58	1,251
8	95	528	5.56	3.14	"	6.08	3,208
10	504	1,502	2.99	2.08	"	4.02	6,063
15	569	4,191	7.36	3.79	"	7.33	30,718



APPENDIX E

INVENTORY FORM



YANTIC RIVER DAM

PHOTO 1

CREST OF DAM - LOOKING SOUTH

PHOTO 2

SPILLWAY CREST

PHOTO 3

CREST OF DAM - LOOKING SOUTH

PHOTO 4

NORTH SPILLWAY TRAINING WALL

PHOTO 5

INLET STRUCTURE - SLUICEWAY

PHOTO 6

SEEPAGE - NORTH SPILLWAY TRAINING WALL

PHOTO 7

DISCHARGE PIPE

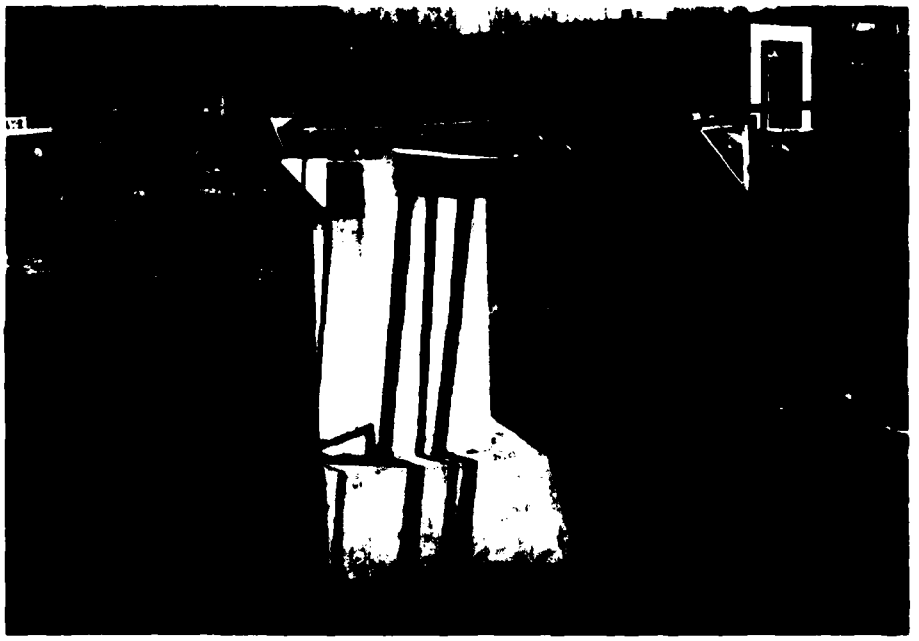


PHOTO 8

CONTROL GATE

PHOTO 9

SLUICEWAY - LOOKING DOWNSTREAM

PHOTO 10

DOWNSTREAM CHANNEL

END

FILMED

9-81

DTIC